Appendix 9

Childcare Remediation

THE URGENT ASSESSMENT, REMEDIATION AND MANAGEMENT OF SIX CONTAMINATED CHILDCARE CENTRES, AUCKLAND, NEW ZEALAND

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1. INTRODUCTION

Between 2003 and 2005, Auckland City's Property group undertook a desktop assessment of all Council-owned land across Auckland in order to determine how many sites were potentially at risk from soil contamination deriving from historic landuse activities. Concurrent with creating this initial database of potential contamination, two child care centres (Learning at the Point kindergarten, Ellerslie playgroup) were tested, with localised elevated benzo(a)pyrene (BaP) contamination found. Targeted remedial measures were implemented at these sites.

The programme was internally transferred to Auckland City's Environmental and Utility Management group in September 2005. The database derived from the desktop study was also transferred and further refined to prioritise early childcare centres operating on Council-owned land for evaluation. This was done because Tier II human health risk assessments carried out previously indicated clearly that children with pica behaviour – i.e. those prone to consume soil – were by far the most sensitive receptor group to contaminants in soil. Exposure times for this group of children could be substantial at playcentres, kindergartens and early learning centres. Thus it was critical to determine which of these centres could be at risk of contamination, then carry out a robust testing regime at these sites.

The database refinement was completed in December 2005. From this, six additional centres (Ferndale kindergarten, Mt Albert playcentre, Auckland Central playcentre, Onehunga playcentre, Freemans Bay early learning centre, Mt Wellington playcentre) were flagged as potentially having soil contamination deriving from on-site or adjacent historic landuse activities, generally involving previous industrial or light commercial use, or based on proximity to a closed landfill. Only one of these centres (Ferndale kindergarten) was flagged because of past horticultural activity.

Ground-truthing occurred in December 2005, involving site visits and visual assessments. The Mt Wellington playcentre was tested in December 2005 and targeted remediation was carried out the following month, involving removal of low-level BaP contamination in surface soil, installation of geotextile barrier matting, replacement with clean soil and surface re-establishment.

2. SITE INVESTIGATIONS

In January and February of 2006, soil testing was carried out at the Auckland Central playcentre in Freemans Bay. The site had historically been used as an ice cream cone factory and furniture outlet; however visual indications showed evidence of filling episodes. Soil testing results

showed BaP concentrations of concern throughout the site. Further background investigation indicated that contaminated fill from the Beaumont St Gasworks in the Western Reclamation area had historically been imported onto the site for construction purposes.

Given the proximity of another of the six listed centres several blocks away (Freemans Bay early learning centre), it was decided to test this nearby site immediately to determine if fill had also been historically imported onto the site. Soil testing here yielded similar levels of BaP, and some marginal exceedences of lead. Another centre not previously flagged on the database (Freemans Bay kindergarten) was added and investigated thereafter due to its proximity, with similar concentrations of BaP identified and a surface hotspot of lead.

Other investigations took place concurrently at the remaining three centres on the list. Soil samples were collected at each site at depths of 0-0.05m, 0.25m and 0.50m intervals at between twelve and twenty locations across the sites. Laboratory analysis of selected soil samples included a standard heavy metal suite (arsenic, cadmium, chromium, copper, nickel, lead and zinc), mercury, total petroleum hydrocarbons (TPH), polycyclic aromatic hydrocarbons (PAH), polychlorinated biphenyls (PCB), semi-volatile organic compounds (SVOC), and organochlorine, organonitrogen and organophosphorus pesticides (OCP, ONP and OPP). The key contaminants of concern at the centres were typically PAHs, in particular BaP equivalent, lead, arsenic, and copper.

The Onehunga playcentre yielded high BaP equivalent concentrations and extreme lead values. The Ferndale kindergarten showed extreme BaP equivalent concentrations, in addition to high lead and arsenic values. Elevated concentrations of BaP equivalent and an isolated arsenic exceedance were also found at the Mt Albert playcentre. A summary of the maximum concentrations detected on site is provided in Table 1 (for parameters where at least one sample was reported above the laboratory detection limit). For the majority of the sites, visual evidence of soil contamination was recorded.

Table 1: Summary of the range of soil contaminant concentrations detected at the childcare centres

Parameter	Ferndale kindergarten	Auckland Central playcentre	Onehunga playcentre	Mt Albert playcentre	Freemans Bay kindergarten	Freemans Bay early learning centre	Tier 1 Guideline Values (Human Health)
BaP equivalent	0.05 – 92.21	0.04 – 29.33	0.04 – 10.97	0.02 – 7.14	0.05 – 27.64	0.04 – 33.99	0.27[2]
Arsenic	6 – 393	<2 – 18	3 – 138	3 – 755	< 2 – 60	5 – 14	30[1]
Cadmium	<0.1 – 1.5	<0.1 – 0.4	0.1 – 3.9	0.1 – 1.1	< 0.1 – 1.5	0.1 – 0.6	20[3]
Chromium (trivalent)	21 – 168	6 – 89	22 – 153	4 – 288	6 – 224	10 – 42	600[1]
Copper	17 – 103	4 – 40	22 – 294	3 – 144	2 – 186	5 – 62	370[4]
Lead	26.2- 2160	14.1 – 249	16.7 - 7210	1.9 – 427	1.8 – 1120	7.1 – 451	300[3]
Mercury	0.1 – 2.4	<0.1 – 0.2	0.1 – 1.7	0.1 – 5.5	< 0.1 – 0.7	<0.1 – 0.4	15[3]
Nickel	15 – 66	3 – 58	19 – 149	3 – 227	< 2 – 65	7 – 111	600[3]
Zinc	62 - 1110	11 - 463	90 - 4420	24 - 758	9 - 767	26 – 880	7000[3]

Notes:

All units in mg/kg dry weight soil, some may be rounded.

1 Ministry of Health (MoH) and Ministry for the Environment (MfE), 1997. Health and Environmental Guidelines for Selected Timber Treatment Chemicals. Chapter 5, Table 5.17 - residential combination (50% home-grown produce).
2 Ministry for the Environment (MfE), 1999. Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand. Module 4, Table 4.10 (<1m depth, sandy silt).
3 National Environment Protection Council (NEPC), 1999. National Environment Protection (Assessment of Site Contamination) Measure 1999. Standard residential with garden/accessible soil (home grown produce contributing <10% produce consumption).
4 Cavanagh and Proffitt 2005. Soil Acceptance Criteria for Sandilands Residential Area. Report to Christchurch City Council, Landcare Research Report LC0405/074.

The precautionary principle was applied throughout the programme, with affected soils immediately isolated with an anchored A19 Bidim geotextile layer, once visual evidence (e.g. clinker observed in surface soils during testing), or interim results indicated surface concentrations of concern. Following the discovery of high contamination levels at Auckland Central playcentre, all laboratory results for the five subsequent investigations had been fast-tracked, with emphasis on receiving surface results.

Centre staff were informed of the results and context of the investigations. Dr Tim Sprott, Auckland City's medical advisor, was on hand at each initial meeting to address medical enquiries from centre staff and/or parents.

For the majority of parents, the initial reaction was one of shock, concern and often anger. Although parents had a greater overall awareness of lead and arsenic, BaP and PAHs were not generally well known. As BaP was the primary contaminant of concern in all cases, this group of chemicals and its likely effects at the levels recorded required careful explanation (refer Section 3).

Auckland City Council's regulatory arm (Auckland City Environments) was contacted at the start of the process to ensure that all upcoming remedial activities were carried out under urgency. Regulatory concerns relating to traffic management, worker health and safety requirements, implementation of volumetric dust sampling, and a robust strategy for protecting scheduled trees were all incorporated into the specific remedial programme for each centre.

Regular contact between Auckland City and the Auckland Regional Public Health Service (ARPHS) was maintained throughout the programme. A Liaison Group was established between Auckland City and the ARPHS to provide updates on progress of investigations, remediation and blood testing. Representatives from the Ministry for the Environment, the Ministry of Education and the Auckland Regional Council were also invited to these meetings.

3. INITIAL HEALTH RISK ASSESSMENT AND COMMUNICATION

Private meetings were held with parents and staff from each of the affected centres. Representatives from the ARPHS and the Ministry of Education were present in an observation and support role. The meetings were directly aimed at providing concerned parents and playcentre staff with information on testing and the remediation approach for their site, and to answer questions regarding any health risks to which the children and/or staff may have been exposed.

The panel consisted of:

- Dr. Bruce Hucker, Deputy Mayor of Auckland as Convenor and political spokesperson
- Michael McQuillan, Acting Manager – City Development (Auckland City)
- Marcus Herrmann, Project Manager - Urban Soils Review (Auckland City)
- Tony Cussins, Senior Environmental Scientist, Tonkin & Taylor Ltd
- Dr. Tim Sprott, Occupational Physician, Occupational Medicine Specialists Ltd

The meetings provided an opportunity for parents and staff to hear about the investigation results, the actions to be taken to ensure no further risk to children or staff would exist at these centres in the future, and to receive the facts about the actual risk that they and their children had been exposed to (refer below for further details on predicted risks). The forums also allowed free rein for the parents to voice their concerns, questions or criticisms about the programme undertaken and the measures proposed.

The meetings were generally received well by the affected communities. Feedback from many parents indicated that these were viewed as a proactive and essential step to providing information, addressing concerns, and allowing those affected to voice their opinions about the programme and its implications. Auckland City continued to hold these meetings on the basis that an open policy was critical to inform people of the risks and that quick and effective action was being taken at their centres to address the unexpected levels of contamination found.

At the request of parents, the media was not invited to these information sessions. Newspaper and radio requests for information were responded to on a reactive basis by Auckland City's media communications group, or by Auckland City's political spokesperson for the programme (the deputy mayor).

Soil concentrations for polycyclic aromatic hydrocarbons (PAHs) in excess of NZ Human Health Guidelines and site specific target levels (SSTLs) were seen at all four sites where blood testing occurred; for lead at Onehunga playcentre and Ferndale kindergarten, and for arsenic at Ferndale kindergarten. The human health risks were assessed including the most site sensitive receptors, children with pica behaviour. The normal public health acceptable risk criterion of an event frequency of no more than 1 in 10^{-5} was used for this risk assessment.

The soil concentrations of PAHs documented at these sites were significantly below levels that would cause acute health effects[1]. The health effects of concern were the additional cancer risks for children who attended these sites for up to 5 years, as well as onsite adults. BaP equivalency is considered as a marker for PAHs as it is the most strongly carcinogenic of the almost 500 PAHs[2]. BaP is classified as a probable non-threshold indirect human carcinogen by IARC -Group B2[3] and US EPA[4]. Long term BaP exposure has been positively associated with lung, bladder,

1 Carl Zenz, O Dickerson, EP Howarth 1994 -Occupational Medicine, 3rd ed.
2 WHO 2000. Polycyclic aromatic hydrocarbons. WHO Regional Office for Europe, Copenhagen, Denmark; Chapter 5
3 IARC 1987 IARC summaries and evaluations: Benzo(a)pyrene. Lyon, France, International Agency for Research on Cancer. Supplement 7.
4 US EPA 1994a Integrated Risk Information System IRIS). Benzo(a)pyrene.

stomach and skin cancers[5] [6] [7] [8]. RISC site specific BaP equivalent Tier 2 estimated additional lifetime cancer risks, using 95% surface UCL values, are shown in Table 2. The range of estimates for pica children varied between 1.4E-05 to 8.7E-05. These estimates exceeded the public health risk criteria. These estimates compared with a predicted lifetime additional 3.0E-5 cases of cancer for people exposed to the average concentration of PAHs in Auckland City ambient air[9], based on an estimated average level of BAP of 3 ng/m^3 Swedish EPA modelling[10].

Table 2: Lifetime cancer risk estimates due to site specific BaP (eq) soil exposures

Site	Non-pica children	Pica children
Onehunga playcentre	8.9E-06	1.7E-05
Ferndale kindergarten	4.6E-05	8.7E-05
Auckland Central playcentre	7.3E-06	1.4E-05
Freemans Bay early learning centre	3.1E-05	5.8E-05

Trivalent arsenic is a known human non-genotoxic carcinogen – Group 1 IARC[11] and US EPA[12] for bladder, lung, and skin cancers. For this risk assessment arsenic was assumed to be a non-threshold carcinogen although there is evidence for threshold responses[13] [14] [15]. The Ferndale kindergarten risk estimates for arsenic are outlined in Table 3. The general Ferndale kindergarten Tier 2 additional lifetime cancer risk estimates using RISC, based on pre-remediation 95% surface UCL values for arsenic, were 2.2E-05 and 2.7E-05 for non-pica and pica children respectively. Non-pica and pica child risk estimates for the vegetable garden section at this site, using 10 % onsite grown produce consumption, were 1.3E-05 and 2.1E-05.

Non-cancer adverse health effects of arsenic include skin hyperpigmentation, keratoses, and peripheral vascular disease[16].

Table 3: Lifetime cancer risk estimates for Ferndale kindergarten vegetable garden

Contaminant	Non-pica children	Pica children
Arsenic	1.3E-05	2.1E-05

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5 WHO 1991. Benzo(a)pyrene WHO Food Additive Series 28. Geneva, World Health Organisation

6 WHO 2000. Polycyclic aromatic hydrocarbons. WHO Regional Office for Europe, Copenhagen, Denmark; Chapter 5.

7 ATSDR (Agency for Toxic Substances and Disease Registry) 1995. Toxicological profile for Polycyclic aromatic hydrocarbons. Atlanta, Georgia, USA, US Department of Health and Human Studies.

8 California Environmental Protection Agency 1997 Public Health Goal for Benzo(a)pyrene in Drinking Water.

9 Ministry of the Environment 2003. Monitoring of CO, NO2, SO2, ozone, benzene and benzo(a)pyrene in NZ. Technical Report.

10 Bostrom C-E et al 2002 Cancer Risk Assessment, Indicators, and Guidelines for Polycyclic Aromatic Hydrocarbons in the Ambient Air – Environmental Health Perspectives, 110 (3); 451-488.

11 IARC 1987 IARC summaries and evaluations: Arsenic and arsenic compounds. Lyon, France, International Agency for Research on Cancer. Supplement 7.

12 US EPA 1993 Integrated Risk Information System (IRIS). Arsenic.

13 Rudel R et al Implications of arsenic genotoxicity for dose response of carcinogenic effects. Regulatory Toxicology and Pharmacology 23:87-105.

14 Basu A et al 2001 Genetic toxicology of a paradoxical human carcinogen, arsenic: a review. Mutation Research 488:171-194.

15 Baars AJ et al 2001 Re-evaluation of human-toxicological maximum permissible risk levels. RIVM Report 711701 025. Bilthoven, The Neatherlands, National Institute of Public Health and the Environment.

16 WHO 2001. Environmental Health Criteria 224: Arsenic and arsenic compounds. Geneva, World Health Organisation.

The risk modelling indicated additional cancer risks from PAH and arsenic soil exposures exceeding 1 x 10^{-5}, particularly for children who had regular exposure in, and consumption of, produce grown in the vegetable garden enclosure at Ferndale kindergarten.

4. REMEDIATION WORKS

Remediation Action Plans (RAPs) were prepared for each centre to manage contaminated soil during site excavation works and to confirm that the site would be suitable for continued operation as a childcare centre in terms of residual ground contamination. Given the nature of the soil contamination, site conditions and ongoing site use as a childcare centre, excavation of contaminated soils followed by reinstatement with a physical barrier and backfill material was considered the most appropriate remediation methodology for the sites.

Remediation works were undertaken in April-May 2006 in accordance with the individual site RAP. The rationale in terms of human health for the remediation (the primary driver for urgent works) was to remove contaminated near-surface materials that children and workers at the playcentre could come into contact with via dermal, ingestion and inhalation. The rationale in terms of the environment was to remove contaminated near-surface materials, to prevent runoff of potentially contaminated sediment during rain or transportation via dust to any environmental receptors such as water bodies and sensitive ecosystems.

Full details relating to the remediation works can be found in the RAPs for each site, which were prepared for ACE and ARC in April 2006. In summary, the general remediation works at each of the centres comprised:

- Removal of impacted exposed soils representing an immediate health risk at the site, including woodchip, sandpit and matting areas;
- Removal of a number of protected native and exotic trees where necessary;
- Transportation and disposal of contaminated material to Redvale Landfill;
- Validation of soils at the base and sidewalls of the excavated void;
- Installation of a physical barrier to mitigate the risk of exposure and access to any underlying residual contamination (comprising: a Bidim A19 anchored to the base of the excavation; Geogrid (Fortrac type 55, installed within the retained tree driplines); a low permeability bund placed around all excavation edges (including the site boundary and edge of retained tree driplines); and backfill comprising clean compacted mudstone, sourced from Redvale, overlain by drainage layers and topsoil);
- Importation and validation sampling of backfill (including mudstone, topsoil, sand and scoria); and
- Post remediation clean down of the site building interior and validation using swab samples collected from hard surfaces.

The typical capping configuration is shown in Figure 1.

With the exception of concrete pathways in the excavation area, removal of contaminated soil from under existing surface seals (e.g. concrete patio) was not carried out as part of the remedial

works programme (as documented in the RAP). Where trees remained, site specific works were conducted under the tree dripline (refer to Figure 1).

In addition to the remedial works and associated validation of surface soil remaining on site, ARC requested the collection of deeper validation soil samples to characterise the nature and potential contamination of soil at depth and determine the extent of remaining fill, and to assist in determining resource consent requirements under the Proposed Air, Land and Water plan (PALW plan). These investigations were conducted concurrently with the site remediation works, and analytical results and discussion of these deeper soil samples provided in the Site Validation Reports (SVRs).

Total suspended particulates (TSP) were measured using a high volume sampler provided by K2 Environmental Ltd in accordance with the Australian/New Zealand Standard AS/NZS 3580.9.6:2003. Air samples were analysed for TSP and contaminants of concern, and results indicated that the air quality measured during remedial works complied with relevant MfE guideline criteria.

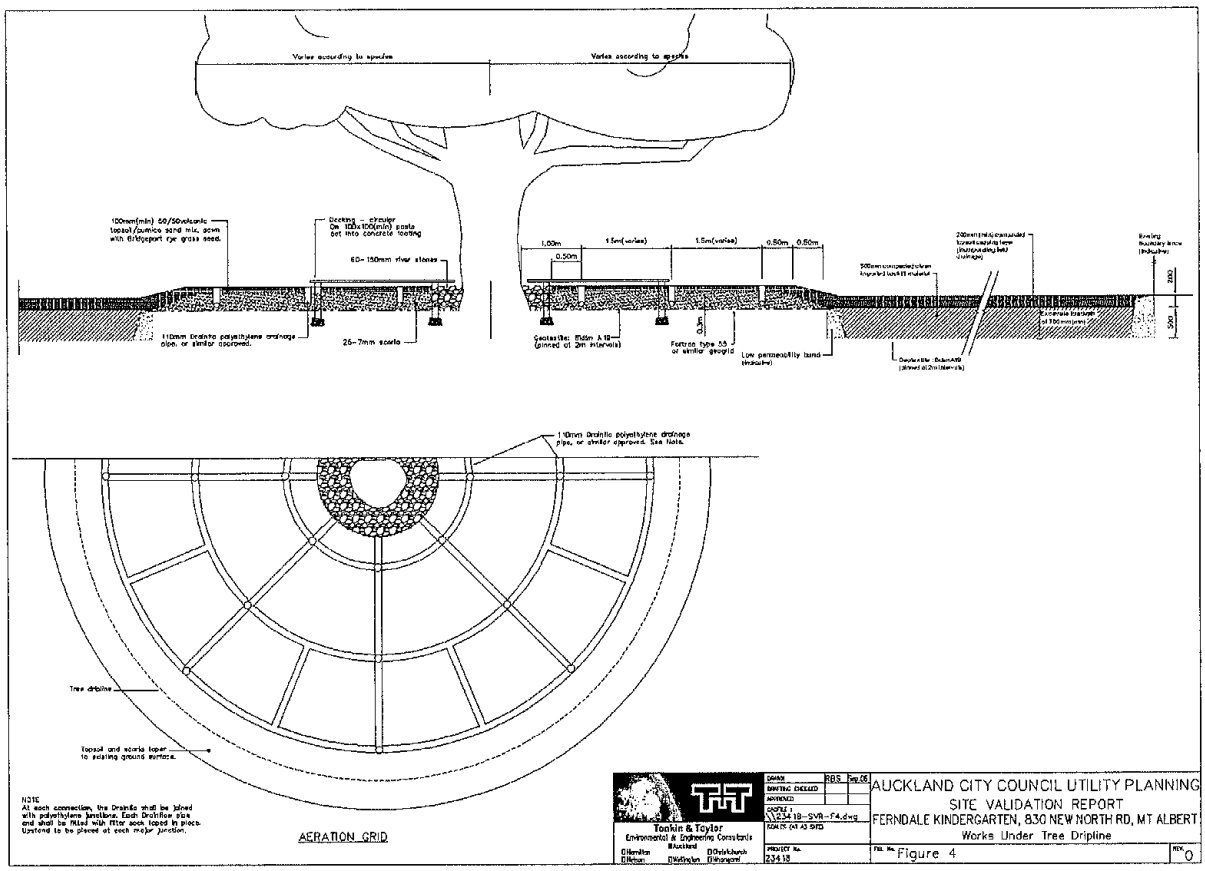

Figure 1: Typical capping configuration installed at the childcare centres.

Following completion of the remediation and backfill programme, the interior of the site buildings was thoroughly cleaned by specialist contractors (TBS Farnsworth Ltd). The clean down comprised the vacuum removal of particulates and dust from all exposed surfaces. Swab

samples were collected from hard surfaces within the playcentre buildings to validate the clean down operation, and analysed for the contaminants of concern. Analytical results indicated that all recorded concentrations were below relevant health guidelines.

Site Validation Reports (SVRs) were subsequently prepared for each site to confirm and document that validation works were conducted as outlined in the RAP, and that the site would be suitable for its continued operation as a childcare centre in terms of residual ground contamination. The SVRs were prepared in general accordance with the Ministry for the Environment (MfE) Contaminated Land Management Guideline No. 1 and the conditions of the Auckland City Environments (ACE) land use consents.

5. HUMAN HEALTH RISK ASSESSMENTS

Tier 2 human health risk assessments were completed for each site to derive site specific target levels (SSTLs) for arsenic, copper, and BaP (contaminants of concern) after completion of the remediation works. SSTLs were derived separately for contaminants of concern in the clean barrier systems and in the residual contaminated soil beneath the barrier system. The standard risk assessment equations presented in the relevant MfE guidelines were modified in MathCAD to reflect actual exposure scenarios for the individual childcare centres.

The SSTLs were derived using the RISC software model developed by BP. The RISC process is fully described in the RISC Workbench User's Manual[17]. For lead in children, a preliminary screening level approach to the human health risk assessment was undertaken using the California Department of Toxic Substances Control (CDTSC) LeadSpread7 model[18]. Detailed risk assessment reports for each site are in preparation.

The RISC model was chosen to derive SSTLs (acceptance criteria) for the contaminants of concern within and below the clean barrier system. RISC is based on the RBCA (Risk Based Corrective Action) methodology. It includes the ability to incorporate a clean barrier system that reflects more accurately the post remediation site conditions. Acceptance criteria for lead are derived separately, as detailed below.

Exposure factors, soil properties and chemical specific fate and transport parameters were adjusted to ensure the model reflected existing relevant risk assessment guidance documents[19 20] for New Zealand. Available site specific information was incorporated into the model. For both the surface and subsurface assessment the combined dermal/ingestion exposure pathway has been identified as the critical pathway driving the human health risk assessment. This pathway is assumed to include exposure to dust. The very high SSTL derived for the inhalation exposure pathway is attributed to the low vapour pressure of BaP and is not discussed further.

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[17] RISC, October 2001. RISC Workbench User's Manual. *Human Health Risk Assessment Software for Contaminated Sites.*
[18] http://www.dtsc.ca.gov/AssessingRisk/leadspread.cfm
[19] Ministry for the Environment (MfE), 1999. Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand.
[20] Ministry of Health (MoH) and Ministry for the Environment (MfE), 1997. Health and Environmental Guidelines for Selected Timber Treatment Chemicals.

The acceptance criteria presented in Tables 4 and 5 below are based on a combined ingestion/dermal pathway for non-pica and pica children. Adults (centre staff and parents) have not been considered for the dermal/ingestion pathway, as potential exposure to contaminated soils is likely to be minimal and is controlled by a long term management plan.

The surface exposure is assumed to occur during the 200 days per year that the child attends the site for a five year period. Subsurface exposure may occur in the very unlikely event that a child manages to penetrate the clean barrier system and geotextile and either ingest or handle contaminated soil. It is conservatively assumed that the same child might penetrate below the clean barrier system in one event per year of up to five days duration.

The CDTSC: LeadSpread7 model is a tool for evaluating exposure and the potential for adverse health effects resulting from exposure to lead in the environment. This model was utilised to derive screening level acceptance criteria for children at each centre. Exposure was assumed to occur via ingestion, dermal contact and inhalation (of dust particles). Exposure of adults (i.e. centre staff or parents) is not considered as their exposure is assumed to be controlled. The derived acceptance criteria for pica and non-pica children are based on a conservative blood lead concentration of 10 ug/dl (below the notifiable blood lead concentration in New Zealand of 15 ug/dl).

Table 4: Ingestion/dermal toxicity factors and Tier 2 acceptance criteria (Mt Albert Playcentre, Onehunga Playcentre)

Contaminant	Slope Factor (non-threshold compound) 1/(mg/kg-day)		RfD (threshold compound) Mg/kg-day		Tier 2 (non-pica child - IR 100 mg/day) (mg/kg)	Tier 2 (pica child – IR 200 mg/day) (mg/kg)
	Ingestion	Dermal	Ingestion	Dermal		
SURFACE						
Benzo(a)pyrene (BaP)[2]	7.3	7.3	NA	NA	5.8	3.1
Arsenic	0.15	NA	0.002	NA	320	160
Copper	NA	NA	0.05	NA	17,100	8,560
Lead[1]	NA	NA	NA	NA	570	290
BENEATH BARRIER SYSTEM						
Benzo(a)pyrene (BaP)[2]	7.3	7.3	NA	NA	232	123
Arsenic	0.15	NA	0.002	NA	12,800	6,390
Copper	NA	NA	0.05	NA	684,000	342,000
Lead[1]	NA	NA	NA	NA	11,500	5,800

Notes:
NA = toxicity factors not available
IR = ingestion rate.
RfD = Reference dose.
1. The acceptance criteria for lead are based on a blood lead concentration of 10ug/dL. The notifiable concentration in New Zealand is 15ug/dL. Screening Tier 2 value is determined by the CDTSC: LeadSpread7 model. Includes ingestion/dermal and inhalation (of dust particles). Leadspread7 does not utilise published toxicity factors.
2. Derived acceptance criteria for inhalation of volatiles have not been presented due to the concentrations calculated being several orders of magnitude above the acceptance criteria for a combined ingestion/dermal exposure.

Table 5: Ingestion/Dermal Toxicity Factors and Tier 2 acceptance criteria (Freemans Bay kindergarten, Ferndale kindergarten, Auckland Central playcentre, Freemans Bay early learning centre)

Contaminant	Slope Factor (non-threshold compound) 1/(mg/kg-day)		RfD (threshold compound) Mg/kg-day		Tier 2 (non-pica child - IR 100 mg/day) (mg/kg)	Tier 2 (pica child – IR 200 mg/day) (mg/kg)
	Ingestion	Dermal	Ingestion	Dermal		
SURFACE						
Benzo(a)pyrene (BaP)[2]	7.3	7.3	NA	NA	4.6	2.5
Arsenic	0.15	NA	0.002	NA	256	128
Copper	NA	NA	0.05	NA	13,700	6,848
Lead[1]	NA	NA	NA	NA	460	233
BENEATH BARRIER SYSTEM						
Benzo(a)pyrene (BaP)[2]	7.3	7.3	NA	NA	186	98
Arsenic	0.15	NA	0.002	NA	10,200	5,110
Copper	NA	NA	0.05	NA	548,000	274,000
Lead[1]	NA	NA	NA	NA	9,200	4,650

Notes:
NA = toxicity factors not available
IR = ingestion rate.
RfD = Reference dose.
1. The acceptance criteria for lead are based on a blood lead concentration of 10ug/dL. The notifiable concentration in New Zealand is 15ug/dL. Screening Tier 2 value is determined by the CDTSC: LeadSpread7 model. Includes ingestion/dermal and inhalation (of dust particles). Leadspread7 does not utilise published toxicity factors.
2. Derived acceptance criteria for inhalation of volatiles have not been presented due to the concentrations calculated being several orders of magnitude above the acceptance criteria for a combined ingestion/dermal exposure.

The RISC model used to derive SSTLs was adapted for use in New Zealand using published and relevant toxicity and exposure factors, and fate and transport parameters. Due to the construction and maintenance of a barrier layer the potential for exposure to residual contamination beneath the barrier system is negligible. The SSTLs for the critical pathway of dermal/ingestion exposure are derived and show that there is negligible risk to the health of the child. SSTLs for exposure via inhalation are a non-critical pathway.

SSTLs for surface exposure were derived assuming that a child was exposed to site surface soils for the whole period of its attendance at each centre. The SSTLs for subsurface exposure were derived assuming that a child at the site was to be inadvertently exposed to the residual contaminants of concern in the fill underlying the clean cap, by utilising an indicative exposure frequency of 5 days per year. In reality it is highly unlikely that any ingestion/dermal exposure will occur provided the barrier system is maintained and managed appropriately.

The CDTSC LeadSpread7 model was used to derive screening level acceptance criteria for lead in children. The Tier 2 soil acceptance threshold level for pica children in surface soils is lower than the Tier 1 guideline. Results show that residual lead concentrations in the fill underlying the clean cap at the site pose a negligible risk to the health of the children at the playcentre.

6. VALIDATION OF BLOOD TEST PREDICTIVE MODELLING

Obtaining biological exposure and effect data for PAHs, arsenic, and lead was considered for risk quantification and validation of the exposure assumptions used in the models. Biological exposure monitoring for BaP using urinary 1-hydroxypyrene was discarded as an option. The disadvantages included the short half-life of this metabolite of BaP, technical difficulties with obtaining pre and post exposure samples in a young age group, finding an appropriate control group, and determining if a single sampling strategy reflected typical site specific exposures or not. Urinary 1-hydroxypyrene measures total body uptake of BaP and not site specific exposures. PAHs, including BaP, have multiple environmental sources, such as food and ambient air. The role of molecular epidemiology, specifically DNA adducts, in health risk assessment and public health policy is still being evaluated[21]. Thus this testing was not undertaken for this project.

Biological monitoring using urinary arsenic shares many of the technical and timing difficulties for 1-hydroxypyrene, as well as the issue of uptake from drinking water, food, environmental tobacco exposure and air pollution[1]. Thus this monitoring was not performed on children at Ferndale kindergarten.

Lead is a heavy metal with well documented toxicity. Children are particularly at risk to the toxicity of lead, the effects of which include anaemia, colic, acute encephalopathy, adverse reproductive outcomes and possibly carcinogenesis[1]. Lower blood lead levels may cause impaired neurocognitive development in children[22] [23] at levels near or below 10µ/dL. For this reason a cut-off level of 10µg/dL for blood lead was chosen for the voluntary blood lead testing programme offered to children and centre staff at these sites, as well as the Leadspread 7 (CDTSC) and IEUBK (US EPA) modelling. The current NZ Ministry of Health guideline is 15µg/dL.

IEUBK and Leadspread7 modelling indicated the potential for children have blood lead levels above 10µg/dL (see Table 8). Estimated mean blood lead levels for children at each of these four sites where blood testing occurred was undertaken using IEUBK with pre-remediation mean and 95% UCL for site surface lead soil concentrations and an age group of 12-84 months. Leadspread 7 used Tier 2 exposure time assumptions but otherwise default values were used. Predicted blood lead levels and actual blood levels are outlined in Tables 7 and 8.

The blood lead testing was performed only after formal written consent was obtained from parents of the children, or from adults carers. The blood lead levels in 7 adults were all 2µg/dL or less. Blood lead assays were obtained from a total of 79 children. The result from one child from Freemans Bay early learning centre, with the lowest 95% UCL for soil lead was excluded. The initial blood lead result was 17µg/dL but on retesting was 2µg/dL. This child was investigated by the ARPHS. The results of the blood lead testing at each of these sites are outlined in Table 6.

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21 Perera F 2000 Review- Molecular Epidemiology: On the Path to Prevention? Journal of the National Cancer Institute, 92 (8); 602 - 612

22 WHO 2000. Safety evaluation of certain food additive and contaminants. Lead. WHO Food Additive Series 44. Geneva, World Health Organisation.

23 US EPA 1994 Technical support document: parameters and equations used in the integrated exposure uptake biokinetic model for lead in children (v0.99d). US EPA Washington DC.

No other children had blood lead levels greater than 10µg/dL. One child with pica behaviour at the Auckland Central playcentre had a blood lead level of 2 µg/dL.

Table 6: Blood lead levels in children at the four centres

Centre	Number of children	Mean blood lead levels (µg/dL)	Standard deviation	Range (µg/dL)
Onehunga playcentre	18	2.53	1.05	<2 to 4.1
Ferndale kindergarten	22	3.90	2.11	<2 to 8.4
Auckland Central playcentre	12	3.58	1.49	< 2 to 6.2
Freemans Bay early learning centre	27	2.00	0.00	<2 to 2

Table 7: Actual vs estimated blood lead levels using mean lead pre-remediation soil lead concentrations

Centre	Mean Pre-remediation soil lead (mg/kg)	Actual Mean blood lead levels (µg/dL)	Leadspread7 prediction non-Pica child(µg/dl) 95th percentile	Leadspread7 prediction Pica child(µg/dL) 95th percentile	IEUBK Mean Prediction (µg/dl)	IEUBK % children >10µg/dL
Onehunga playcentre	362.3	2.53	5.6	8.3	4.75	5.7
Ferndale kindergarten	375.0	3.90	6.4	10.0	4.85	6.2
Auckland Central playcentre	97.8	3.58	3.5	4.2	2.43	0.13
Freemans Bay early learning centre	92.50	2.00	4.5	6.3	2.38	0.11

Table 8: Actual vs estimated blood lead levels using 95% UCL soil concentrations

Centre	95%UCL Pre-remediation soil lead (mg/kg)	Actual Mean blood lead levels (µg/dL)	Leadspread7 prediction non-Pica child(µg/dl)	Leadspread7 prediction Pica child(µg/dL)	IEUBK Prediction (µg/dl)	IEUBK % children >10µg/dL
Onehunga playcentre	550	2.53	7.0	11.2	6.3	15.9
Ferndale kindergarten	630	3.90	8.9	14.8	6.9	21.2
Auckland Central playcentre	133	3.58	3.7	4.7	2.8	0.30
Freemans Bay early learning centre	150	2.00	5.6	8.5	2.9	0.44

The actual mean blood lead levels were lower than predicted by the models, except at the Auckland Central playcentre using estimated site mean (Table 7) and 95% UCL (Table 8) pre-remediation soil lead concentrations. The actual mean blood level in children at this site was 3.58µg/dL. The IEUBK estimates using mean and 95% UCL site lead soil concentrations were 2.43µg/dL and 2.8µg/dL respectively. The non-pica child prediction by Leadspread7 was 3.7µg/dL. Among the possible explanations for these variances are that the estimated mean and 95% UCL soil lead concentration estimates had a poor correlation with the specific exposures that the children had at the Onehunga playcentre, Ferndale kindergarten and Freemans Bay early learning centre, that lower exposures occurred in the children at the Onehunga playcentre, Ferndale kindergarten and Freemans Bay early learning centre compared with the Auckland

Central playcentre; that children at the Auckland Central playcentre had alternative non-site lead exposures compared with children from the other sites; that the sample size was too small; that the actual blood lead levels were biased by selection/volunteer biases; or that the models may be inappropriate risk tools, or assumptions, in these types of settings.

7. ONGOING SITE MANAGEMENT

Ongoing site management is an issue at every centre remediated. A Site Management Plan is under development for each centre, which will clearly define both centre and council responsibilities into the future. Annual checks will be made by Auckland City to ensure the isolation and protective measures implemented remain functional, and that recontamination has not occurred.

Adjoining properties where soil contamination is believed to exist also have management responsibilities towards these centres. Should any significant excavation for development purpose take place, the activities will be required to meet human health protection criteria under Auckland City resource consent.

8. ACKNOWLEDGEMENTS

John Evans, Kirsty Jones and Mark Fenwick (Communications and Marketing, Auckland City) are thanked for their significant inputs throughout the project. The contributions of Dr Bruce Hucker (Deputy Mayor, Auckland City) Michael McQuillan (Environmental and Utility Management, Auckland City), and Tam White (Democracy Services, Auckland City) during the project are appreciated, as is the support of Dr Virginia Hope, Dr Denise Barnfather, Dr William Rainger and Dr Julia Peters of the Auckland Regional Public Health Service, and representatives of the Auckland Kindergarten Association and the Auckland Playcentre Association. The work of City Parks and Dave Serjeant is also acknowledged.

Appendix 10

Claris Landfill

APPENDIX 10

Great Barrier Island – Claris Landfill

Update Paper – June 2009

EXECUTIVE SUMMARY

Auckland City Council owns and operates the Claris landfill on Great Barrier Island - the sole site consented to accept, treat and dispose of waste materials. Septage, scrap vehicles, used tyres and small quantities of household hazardous wastes are also accepted. The long-term strategy for Claris Landfill has been staged refuse disposal within the designated landfill footprint, supported by increased resource recovery of paper and card, recyclables, greenwaste, and selected C&D[1] and inorganic wastes. However, a comprehensive waste services review was recently undertaken to compare various on and off-island options for refuse, recycling and reusable materials. These options were considered to assess whether Claris Landfill should remain operating until capacity is reached, or if off-island disposal and diversion is more beneficial.

As well as describing key outcomes from the waste services review, this report provides an overview of the site history, activities undertaken and recent improvements for Claris Landfill. The effects of recent legislation are outlined, as are details of consultation, consenting issues and other challenges.

Key implications of the WMA for Claris Landfill are:

- A levy of $10 per tonne paid by Council into the central government fund for each tonne of material entering the landfill for disposal.
- Reporting to the Ministry for the Environment on disposal quantities, and potentially also diverted materials.
- Material intended for diversion cannot be stored onsite for more than 6 months otherwise the levy will be applied. Council will need to apply for an exception to this rule to allow longer-term storage at Claris Landfill (required for economic shipping off the island).

It is not intended that materials specifically purchased for use as cover / capping material be subject to the levy, nor is it intended that material recycled or reused as cover material incur the levy charge[2]. This second point – exclusion of material reused or recycled as cover – assumes that the cover is laid within 6 months of the material coming on site (refer to bullet point above for comments on 6 month limit).

The proposed Hauraki Gulf Islands District Plan was introduced in 2006 and, as part of the plan review process, ACC applied to have the previous waste activity designation for Claris Landfill rolled over and extended to include adjacent Department of Conservation land (to allow possible ACC purchase and use). Approval was given for the new designation and the plan is currently in appeal stage.

[1] Construction and Demolition wastes

[2] "Supplementary guidance note on the waste levy and cover material" – as received by ACC in June 2009, from the Ministry for the Environment.

Since 1999, the waste disposal and septage treatment operations have been carried out under two Auckland Regional Council (ARC) resource consents, both of which expire 31 December 2027. Shortly after the issuing of the ARC consents it was identified that the proposed refuse cell layout was not practically feasible and steps were undertaken to review and amend the refuse filling plan. A process was agreed with the ARC to achieve compliance and an application was submitted to the ARC to split refuse disposal and sludge disposal into separate consents. However, ACC have since withdrawn the new septage discharge consent application and are continuing to operate using the current, consenting method (sand filtration). ACC undertook a site visit with the ARC on the 23rd February 2009. A site inspection checklist was completed by the ARC, demonstrating their acceptance of site activities and commenting that the site is well run despite limited resources.

Consultation over the past 24 months has been primarily with DoC with regard to the purchase of adjacent land. Regular updates also continue to be provided to the Community Board. Further consultation will be undertaken once future activities have been prioritised and resource consent applications readdressed.

Incoming refuse tonnages are currently estimated at 941 tonnes[3], higher than was recorded for previous years. Key components of the island's wastestream are paper/cardboard, organic waste and general recyclables, i.e. plastic, glass and metal. In addition, around 400 tonnes per year of septage are received at Claris Landfill. Following treatment this reduces to around 50 tonnes of solid by-product (sludge), which is disposed of within Claris landfill.

Around 60 tonnes of recyclables (cardboard, plastic, glass, aluminium cans and steel tins), 260 tonnes per year of greenwaste[4] and 16 to 20 tonnes of car batteries are diverted from Claris Landfill each year. Other reusable bulky material such as whiteware, timber etc. are currently being stockpiled at the landfill for future reuse/recycling (estimated at a further 10%). Approximately 110 tonnes per year[5] of vehicle bodies are also transported from Claris Landfill to the mainland for recycling.

Based on 941 tonnes per year of incoming refuse, the remaining landfill life is 17 - 33 years[6] (dependent on level of compaction achieved). If a further 20% of recyclables were to be diverted, landfill life would increase to 23 - 43 years. The higher range figures assume sufficient compaction to achieve a placed refuse density of around 700kg/m^3. It is intended that a compactor will be brought on site to achieve this.

Other improvements recently made or planed for Claris Landfill are:

- a permanent weighbridge (helping to meet WMA reporting requirements)
- New site office and facilities for staff
- Training for staff involved in the handling of hazardous wastes
- Upgrade of shipping containers to store household hazardous wastes
- car crushing facility
- working with local residents to run free composting courses
- kerbside recyclables collection trial
- wastes services review for on and off-island options (long-term strategy)

[3] Estimate provided by Bob Turnbull, May 2009, derived from GB Cartage Community Board reporting data.

[4] Based on assumed bulk density factor of 0.3 T/m^3

[5] Based on tonnage data provided by Bob Turnbull, derived from GB Cartage Community Board reporting figures.

[6] The 2005 landfill volume is used as a baseline for consistency with previous capacity estimates.

Based on transport costs, logistical issues, and options for on-island use versus revenue from off-island sale, it is recommended that greenwaste and glass remain on-island, with treatment and use as per the status quo. Based on costs and handling issues, septage should also continue to be processed on island using the current method (treatment by sand filter). Regardless of whether Claris Landfill continues to operate, disposal of the filtered solid will be required.

Further, it is recommended that Claris Landfill continues to operate for as long as possible, with land purchased from DOC for the buffer strip, storage of capping material, and for the potential relocation of the car crushing facility. The costs of developing a resource recovery park are prohibitive at this stage, with revenue less than costs to ship the material off the island. However, this may change in the future, and if so, land would be available for the development.

Assuming that Claris Landfill will continue to operate, there are a number of planned operational improvements:

- An on-site compactor will increase the landfill capacity and ultimate lifespan by maximising the use of available void space.

- A second-hand generator has been identified for potential use at Claris landfill, with sufficient capacity to provide for future requirements.

- Relocation of the existing car crushing facility will allow the area upon which it currently sits to be used for refuse disposal (it is currently inaccessible). The facility could either be relocated to the new area behind the landfill (following land purchase from DoC) or could be moved to another part of the landfill site.

- If purchased from DoC, the new area of land could also be used to stockpile future capping material.

There has been extensive investigation work carried out to decide if changes should be made to the existing septage treatment facility (sand filter facility). A range of options for on and off-island treatment of septage were considered, and onsite lime stablisation or off-site disposal using dewatering pumper trucks were shortlisted as the most viable alternatives. However, based on high development costs for the lime stabilisation facility, and increased administration required for the dewatering pumper truck option, it has been decided to continue with the current sand filter option in the short to medium term. This current option is fully consented and provides an on-island, cost effective option for Council and the island's residents.

CONTENTS

1. Introduction

Auckland City Council (Council) manages the collection and disposal of waste generated on Great Barrier Island (GBI) and provides collection, sorting, reuse and disposal services for a range of diverted materials. As part of these services, Council owns and operates the Claris landfill, located on the island at 70 Gray Road. Claris Landfill is the sole GBI site consented to accept, treat and dispose of waste materials. Claris landfill also legally operates as a receiver and treater of septic tank pump-outs, a car storage and crushing facility and accepts small quantities of household hazardous waste. Continued operation is reliant on having a 10 metre buffer zone to separate waste from the outer landfill boundary. The Department of Conservation (DoC) owns the land surrounding the landfill and has indicated their agreement should Auckland City wish to purchase areas for buffer strips.

A further area could also be acquired from DoC to provide for relocation of the car crushing facility, storage of capping material and potentially an area for a small resource recovery facility. To help decide whether or not to purchase this additional land, a comprehensive island-wide review has been undertaken to identify options for waste collection, treatment and disposal. This review has also assessed a range of on and off-island options for refuse, recycling and reusable materials. These options were considered to assess whether Claris Landfill should remain operating until capacity is reached, or if off-island disposal and diversion is more beneficial.

This report describes the key outcomes from the recent assessment (including costs) as well as providing a general site history and update on site activities and recent improvements. Effects of recent legislation on the landfill operation are also outlined, as are details of consultation, consenting issues and other challenges.

2. Legislation & Regulatory Controls

Implications of the newly introduced Waste Minimisation Act 2008 (WMA) – the key legislative driver for Claris Landfill – are discussed below. An update on regulatory controls is also provided.

2.1 Waste Minimisation Act

Key implications of the WMA for Claris Landfill are:

- A levy of $10 per tonne will need to be paid into the central government fund for each tonne of material entering the landfill for disposal. As landfill owners, this cost will be incurred by Council. Costs would need to be covered via rates or a gate rate would need to be introduced.
- Council will be required to collate and submit information on waste tonnage to the Ministry for the Environment. Potentially, data on diverted materials will also need to be collated (details still to be confirmed by the Ministry).
- Material intended for diversion cannot be stored onsite for more than six months otherwise the levy will be applied. This is an issue for due to the length of time that materials are stored before they can economically be shipped off the island (car bodies, recyclable metals, tins and plastic etc.). There is ability under the act to apply for an exception to this requirement.

It is not intended that materials specifically purchased for use as cover / capping material be subject to the levy, nor is it intended that material recycled or reused as cover material incur the levy charge[7]. This second point – exclusion of material reused or recycled as cover – assumes that the cover is laid within six months of the material coming on site (refer to bullet point above for comments on six month limit).

2.2 Regulatory Overview

2.2.1 Designation

The proposed Hauraki Gulf Islands District Plan was introduced in 2006 and decisions on the plan were publicly notified on the 4th of May 2009 (open to appeal until late June). As part of the plan review process, ACC applied to have the previous waste activity designation for Claris Landfill rolled over. In addition a request was made to extend the designation over the adjacent DoC owned land, to allow for possible future purchase and use by ACC.

Although now subject to appeal, approval was given for the new designation. The designation conditions are reasonable and generally in accordance with the landfill's Operational Management Plan. The additional land area included within the designation comprises of a 10m buffer zone to the south of the landfill and a further 8,300m^2 to the east.

2.2.2 Regional Discharge Consents (ARC)

Since 1999, the waste disposal and septage treatment operations have been carried out under two Auckland Regional Council (ARC) resource consents, both of which expire 31 December 2027. They are:

Permit 9510335 - to deposit domestic refuse and septic tank sludge onto the ground
Permit 9510336 - to discharge leachate from an operating sanitary landfill into the ground and groundwater beneath the site

Shortly after the issuing of the ARC consents it was identified that the proposed refuse cell layout was not practically feasible and steps were undertaken to review and amend the refuse filling plan. Consequently a process was agreed with ARC for achieving compliance which involved the development of a modified final refuse contour plan, a modified operational management plan. In addition an alternative long-term sludge disposal methodology was assessed.

An application was submitted to the ARC to split Permit 9510335 into a 'domestic refuse disposal to ground' consent and a 'septic tank sludge disposal to ground' consent. Permit 9510336 is to be split into a discharge of leachate from an operating sanitary landfill consent (discharge to ground and groundwater) and a discharge consent for leachate from septic tank sludge disposal (to ground and groundwater). ACC have since withdrawn the new septage discharge consent application and are continuing to operate under the existing consent until an improved methodology is selected. The ARC is periodically informed on options that are being considered by the ACC for future management of septage. The consent applications relating to the remaining landfill activities are currently under consideration by the ARC.

[7] "Supplementary guidance note on the waste levy and cover material" – as received by ACC in June 2009, from the Ministry for the Environment.

ACC undertook a site visit with the ARC on the 23rd February 2009. A site inspection checklist was completed by the ARC, demonstrating their acceptance of site activities and commenting that the site is well run despite limited resources. The ARC requires an updated landfill management plan (LMP) to outline how the site is currently operating. This LMP will act as a legal document setting out operating and monitoring parameters until changes to the resource consents are settled.

3. Consultation / Communications

Consultation over the past 24 months has been primarily with DoC and focused upon the option of purchasing the adjacent piece of land. Regular updates continue to be provided to the Community Board.

Discussions with affected parties about landfill operation and future planning has in the form of providing updates rather than undergoing statutory level consultation. This is on the basis that the ARC consents will be publicly notified in due course. Where possible, feedback from those immediately affected by the landfill operation has been considered and incorporated into the site's Operational Management Plan.

Further consultation will be undertaken once future activities have been prioritised.

4. Current Site Operations

4.1 Incoming Wastes

4.1.1 Composition

A temporary weighbridge was trialled on site from September 2007 to March 2008, and a permanent weighbridge installed on the 19th of June 2009. However, problems were experienced with the weighbridge foundations. The weighbridge is due to be reinstalled on the 19th of June with tonnage records expected to be available shortly thereafter (volumes previously estimated based on visual assessments).

Based on the 2002 SWAP audit, key components of the island's wastestream are paper/cardboard, organic waste (food and garden wastes) and general recyclables, i.e. plastic, glass and metal. Potential remains to increase the diversion of plastic, paper/card and metal. Food waste is another significant component of the waste stream that could potentially be diverted (viability of doing so depends on capital and operational cost requirements, and end use).

4.1.2 Quantities

Incoming refuse tonnages are currently estimated at 941 tonnes[8]. The greatest monthly tonnage is generally over the peak season (1 December to 31 February), with landfill tonnages increasing by up to 300% from June-July (around 30-40 tonnes per month) to around 100 tonnes per month in January. GB Cartage tonnage data for 2006 to 2008 indicates that high refuse volumes may also occur in March / April.
Approximately 400 tonnes per year of septage are received at Claris Landfill for treatment via sand filtration. This creates around 50 tonnes of solid by-product (sludge) which is disposed of within Claris landfill.

[8] Estimate provided by Bob Turnbull, May 2009, derived from GB Cartage Community Board reporting data.

4.1.3 Waste Sources

The Waste Not 2002 Analysis indicates that approximately 7% of all waste on the island is commercial, 19% is household waste delivered straight to landfill, and the remaining 75% collected by GB Cartage. Of the waste collected by GB Cartage, approximately 95% is collected from drop-off facilities and the remaining 5% from the kerbside.[9] Other than vehicle bodies, which are delivered directly to the landfill, diverted materials are collected from drop-off facilities.

4.2 Diversion Achieved

Around 60 tonnes of recyclables (cardboard, plastic, glass, aluminium cans and steel tins) are diverted from Claris Landfill each year, along with around 260 tonnes of greenwaste[10] and 16 to 20 tonnes of car batteries are diverted. Other reusable bulky material such as whiteware, timber etc. are currently being stockpiled at the landfill for future reuse/recycling (estimated at a further 10%).

Facilities are also provided at Claris Landfill for the collection of unwanted vehicles, with car bodies transported back to the mainland for maximised recycling and final disposal. These vehicle bodies equate to around 110 tonnes per year[11].

4.3 Remaining Landfill Life

There are three key factors that impact on landfill capacity and lifespan estimates:

1 tonnages are higher than previously thought;
2 increased diversion of recoverable materials from the landfill is planned;
3 a compactor may be brought on site to improve refuse compaction rates.

Taking the (higher) incoming tonnages of 941 tonnes per year into account, the estimate of remaining landfill life within the current footprint is 17 - 33 years[12] (dependent on level of compaction achieved). If a further 20% of recyclables were to be diverted, landfill life would increase to 23 - 43 years (again, dependent on level of compaction achieved).

It is expected that the compaction rate currently being achieved is around 400kg/m^3. ACC is considering bringing a compactor on site for use at Claris Landfill to achieve an improved (placed) density of around 700kg/m^3. Improved density with increased diversion would achieve a landfill life of around 43 years. Improved compaction at current diversion rates would result in around 33 years of landfill life remaining.

5. Recent Improvements

A number of improvements have been made on site in recent years to address operational efficiency, worker health and safety, environmental protection, waste minimisation and community education. Waste minimisation improvements also had

[9] Community Board Reporting 2008-09 Tonnages

[10] Based on assumed bulk density factor of 0.3 T/m^3

[11] Based on tonnage data provided by Bob Turnbull, derived from GB Cartage Community Board reporting figures.

[12] The 2005 landfill volume is used as a baseline for consistency with previous capacity estimates.

the added benefit of extending the landfill life (benefit lying in the increased cost should refuse be required to be taken off island).

Key improvements are outlined below.

- A permanent weighbridge was installed to increase reporting accuracy (partially in response to WMA requirements for tonnage reporting).
- New site office and facilities were provided for staff, including a 'haz shower'.
- There is an ongoing training commitment and plan in place for staff involved in the handling of hazardous wastes.
- Shipping containers to store household hazardous wastes were upgraded.
- There is ongoing provision for a car crushing facility, ensuring that fluids are safely drained and recycling is optimised when vehicles are shipped back to the mainland. Vehicles are and crushed and shipped away every two years.
- ACC is working with local residents to run free composting courses. These are to be delivered by residents, for residents, with local involvement increasing employment opportunities, awareness and self ownership;
- A kerbside recyclables collection trial is underway;
- An investigation is underway into options for increased on and off-island reuse or recycling, and options for future waste disposal.

6. Long-term Strategy for Claris Landfill

The long-term strategy for Claris Landfill was previously noted as staged refuse disposal within the designated landfill footprint supported by increased recovery of paper and card, recyclables, greenwaste, and selected C&D[13] and inorganic wastes. The 2006 Waste Management Plan also states that waste services are preferably undertaken from start to finish on the island, with no user-pays collection or disposal fees imposed. However, the most sustainable long-term strategy for managing GBI wastes could involve some or all of the island's wastes being transported off island.

A range of on and off-island options for the recovery and disposal of GBI's recyclables and general refuse have been considered and are summarised below.

6.1 On versus off-island

Based on transport costs, logistical issues, and options for on-island use versus revenue from off-island sale, it is recommended the following recyclable materials remain on-island, with treatment and use as per the status quo:

- Greenwaste - processing to remain on-island regardless of whether Claris landfill remains operating or not – sensible option, easy and low cost processing plus generation of useful resource

- Glass - crushing and reuse as aggregate material to continue on-island regardless of whether Claris landfill remains operating or not. This recommendation is based on the current crushing method and on-island uses being available. If a hammermill is required and/or on-island market reduces, then it may be more cost effective to ship off island. It is estimated that two trips

[13] Construction and Demolition wastes

per year would be required, with revenue from glass sale funding or subsidising shipping and road transport (based on minimum revenue rate of $60/T).

Based on costs and handling issues, septage should also continue to be processed on island using the current method (treatment by sand filter). Regardless of whether Claris Landfill continues to operate, disposal of the filtered solid will be required.

The recommended GBI waste scenario would have Claris Landfill continue to operate for as long as possible. Land would be purchased from DOC for the buffer strip, potential relocation of the car crushing facility and for storage of capping material. Material specifically purchased for capping would be except from the waste levy. Material recovered from the general waste stream for reuse as capping would require an exemption from the landfill levy (as defined under the WMA) if it is to be stored for more than six months.

The costs of developing a resource recovery park are prohibitive at this stage, with revenue less than costs to ship the material off the island. However, this may change in the future, and if so, land would be available for the development. Estimated costs for the waste services review are included within Appendix A.

6.1.1 Additional Landfill Improvements

Assuming that Claris Landfill will continue to operate, there are a number of planned operational improvements. These are described below.

- An on-site compactor will increase the landfill capacity and ultimate lifespan by maximising the use of available void space. It is envisaged that this plant would be purchased by ACC and this asset either maintained by, or potentially sold to, the landfill contractor. In the latter event, a suitable lease and buy-back arrangement would need to be written into the Contract.

- Due to the remoteness of the site power is provided via diesel generators. A second-hand generator has been identified for potential use at Claris landfill, with sufficient capacity to provide for future requirements.

- Relocation of the existing car crushing facility will allow the area upon which it currently sits to be used for refuse disposal – it is part of the landfill footprint but is currently inaccessible.

- If purchased from DoC, the new area of land could also be used to stockpile future capping material. This would allow clay that is delivered to the site as waste material to be set aside for final capping, reducing future costs. It is assumed that up to 75% of required material could be stockpiled in this way.

6.2 Septage Treatment

There has been extensive investigation work carried out to decide if changes should be made to the existing septage treatment facility (sand filter facility). A range of options for on and off-island treatment of septage were considered, and two options shortlisted for further assessment:

- an onsite lime stabilisation facility, with an estimated capital cost of around $510,000 - $530,000 (including 30% contingency); or,

- a specialist dewatering pumper truck bought onto the island periodically, with dewatered sludge taken to the mainland for disposal and filtered water returned to the septic tanks (maintaining biological activity within the tank).

However, based on the high development cost for the lime stabilisation facility, and increased administration required for the dewatering pumper truck option (scheduling multiple pump-outs per visit), it has been decided to continue with the current sand filter option in the short to medium term. This current option is fully consented and provides an on-island, cost effective option for Council and the island's residents.

Appendix A

Waste Services Review, Costings

GBI COSTINGS MODEL - STATUS QUO - assumes purchase of buffer strip land Revision: 12.05.09

ASSUMPTIONS:

Annual Cost Adjustments	
Average annual increase, based upon the Contract CPI rate - which is assumed will continue into the next Contract, and is also applied as an average annual increase to construction activities and plant outside of the disposal contract	8.5%
Assumed annual increase for supervision contract and other professional services (design, testing, survey etc.) + for inflationary incr. in recycling revenue rates:	3.0%
Assumed maintenance cost for purchased specialist plant (weighbridge, generator, compactor) - nominated % of capex	3%

A. OPERATIONAL EXPENDITURE - SUMMARY & SPREAD

		Year	*0*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*18 YEAR TOTAL*
Activity		*Year end (July)*	*2009/10*	*2010/11*	*20011/12*	*2012/13*	*2013/14*	*2014/15*	*2015/16*	*2016/17*	*2017/18*	*2018/19*	*2019/20*	*2020/21*	*2021/22*	*2022/23*	*2023/24*	*2024/25*	*2025/26*	*2026/27*	*2027/28*	
1	**LANDFILL OPERATION - CURRENT FOOTPRINT**																					
1.1	Contract - for management of landfill	Rollover from existing Contract in 2008 - includes for all ongoing opex costs relating to filling on the facility, capping, greenwaste and sandfilter.	$ 310,363	$ 336,744	$ 365,367	$ 396,423	$ 430,119	$ 466,679	$ 506,347	$ 549,387	$ 596,084	$ 646,752	$ 701,725	$ 761,372	$ 826,089	$ 896,306	$ 972,492	$ 1,055,154	$ 1,144,842	$ 1,242,154	$ 1,347,737	$ 13,552,137
1.2	Supervision - by Council staff	Island-based supervisor employed by ACC outside of GBCartage landfill operation contract ('eyes and ears')	$ 37,671	$ 40,873	$ 44,347	$ 48,117	$ 52,207	$ 56,645	$ 61,459	$ 66,683	$ 72,351	$ 78,501	$ 85,174	$ 92,414	$ 100,269	$ 108,792	$ 118,039	$ 128,072	$ 138,959	$ 150,770	$ 163,585	$ 1,644,930
1.3	Weighbridge - maintenance and other miscellaneous operating costs	Based upon a nominated percentage of capital cost ($100k)	$ 3,532	$ 3,832	$ 4,158	$ 4,511	$ 4,894	$ 5,310	$ 5,762	$ 6,252	$ 6,783	$ 7,360	$ 7,985	$ 8,664	$ 9,400	$ 10,199	$ 11,066	$ 12,007	$ 13,027	$ 14,135	$ 15,336	$ 154,212
1.4	Diesel Generator - maintenance and other miscellaneous operating costs	Based upon a nominated percentage of capital cost ($7k)	$ 247	$ 268	$ 291	$ 316	$ 343	$ 372	$ 403	$ 438	$ 475	$ 515	$ 559	$ 606	$ 658	$ 714	$ 775	$ 840	$ 912	$ 989	$ 1,074	$ 10,795
1.5	Monitoring	Undertaken six monthly	$ 11,176	$ 11,511	$ 11,856	$ 12,212	$ 12,578	$ 12,955	$ 13,344	$ 13,744	$ 14,157	$ 14,581	$ 15,019	$ 15,470	$ 15,934	$ 16,412	$ 16,904	$ 17,411	$ 17,933	$ 18,471	$ 19,026	$ 280,694
1.6	Annual Topographical Survey	Two out of every three years is a survey of the 12mth refuse placement, while every three years there is a more extensive survey and reinstallation of controls etc. It is assumed that the 3-yearly more extensive survey is one third more expensive than the standard survey.	$ 5,588	$ 3,837	$ 3,952	$ 6,106	$ 4,193	$ 4,318	$ 6,672	$ 4,581	$ 4,719	$ 7,291	$ 5,006	$ 5,157	$ 7,967	$ 5,471	$ 5,635	$ 8,706	$ 5,978	$ 6,157	$ 9,513	$ 110,845
1.7	SWAP survey (waste composition)	Assumed to take place every 3 years, starting 2008/09			$ 21,854.54			$ 23,881.05			$ 26,095.46			$ 28,515.22			$ 31,159.35			$ 34,048.66		$ 165,554
1.8	Annual Operational Review / Performance Review	Assumed no cost - internal	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
1.9	Refuse reports to ARC (six monthly)	Assumed no cost - internal	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
1.10	Annual Report - to ARC	Assumed no cost - internal	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
1.11	Car Bodies compaction and transport, plus Tyre disposal **overestimate to occur every 2yrs for first 4yrs, then every 5yrs thereafter	Occurs once every 2 yrs for 1st 2 years, then 5 yearly thereafter	$ 117,723		$ 138,586					$ 208,386					$ 313,340					$ 471,156	$ -	$ 1,249,191
1.12	Final Capping and Closing of cells - including grassing	Occurs after car bodies moved and then at say 3 year intervals. Note: base costs are total cost estimate for final capping, in 2007/08 dollars. Allowance made for annual cost increases when pricing three yearly capping				$ 70,205			$ 91,601			$ 100,095			$ 109,377			$ 119,519			$ 130,602	$ 621,399
1.12a	Placement of initial cleanfill/soil layer - staged, portion laid every 3yrs	Assume soil is available from the site, placed and compacted at $5/m3 (2007/08 base rate)				$ 5,960.79			$ 7,777.47			$ 8,498.66			$ 9,286.71			$ 10,147.84			$ 11,088.82	$ 52,760
1.12b	Clay supply and placement (track rolled to achieve permeability of 10-7) - staged, portion laid every 3yrs	Available on the island but supply dictated by roading work and local building projects. Assume 75% of clay is sourced as material for disposal (i.e. no cost to ACC) and remainder is imported at $10/m3. Assume $5m3 for placement and compaction. (2007/08 base rates)				$ 17,882.36			$ 23,332.42			$ 25,495.97			$ 27,860.13			$ 30,443.52			$ 33,266.46	$ 158,281
1.12c	Topsoil (150mm depth as per OMP) - staged, portion laid every 3yrs	Not available on island so need to import. $20-30/m3 ex yard, so assume $50/m3 including transport and placement. (2007/08 base rates)				$ 29,803.93			$ 38,887.37			$ 42,493.28			$ 46,433.56			$ 50,739.20			$ 55,444.09	$ 263,801
1.12d	Grass seeding (over 1.5Ha area) - staged, area grassed every 3yrs	Assume $5/m2 (2007/08 base rate)				$ 16,557.74			$ 21,604.10			$ 23,607.38			$ 25,796.42			$ 28,188.45			$ 30,802.27	$ 146,556
1.13	Prepare landscaping plan	One-off	$ 15,000.00																			$ 15,000
1.14	Landscaping - buffer zones	Planting and shaping	$ -	$ 32,530	$ 3,377	$ 3,377																$ 39,284
1.14a	Supply and Planting	Assume $116/tree ($95/tree (1.5-2m) supply + $5 transport + $16/tree planting cost). Assume 1 tree per 2m, 550m buffer strip length - say 230 trees (2007/08 base rates)		$ 29,154																		$ 29,154
1.14b	Maintenance	$250/day x 1 day per month x 3yrs (2007/08 base rates)		$ 3,377	$ 3,377	$ 3,377																$ 10,130
$ 1.15	Consultancy Services	Additional consultancy services (to assist with new Disposal Contracts and/or Variations for the RRC etc.)	$ 15,914	$ 16,391	$ 16,883	$ 17,389	$ 17,911	$ 18,448	$ 19,002	$ 19,572	$ 20,159	$ 20,764	$ 21,386	$ 22,028	$ 22,689	$ 23,370	$ 24,071	$ 24,793	$ 25,536	$ 26,303	$ 27,092	$ 399,697
	Subtotal - Operational expenditure, landfill		$ 517,212	$ 445,986	$ 610,671	$ 558,655	$ 522,245	$ 588,609	$ 704,591	$ 869,042	$ 740,824	$ 875,859	$ 836,855	$ 934,225	$ 1,405,722	$ 1,061,263	$ 1,180,141	$ 1,366,502	$ 1,347,188	$ 1,964,184	$ 1,713,964	$ 18,243,737
3	**TRANSPORTATION COSTS - to isthmus**																					
3.1	RECYCLING	Transportation via local truck driver at no cost to ACC, no/nominal revenue received																				
3	**Subtotal - TRANSPORTATION OPERATION - to isthmus**		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	***$0***
		ANNUAL TOTAL OPEX, assuming purchase of buffer strip goes ahead	**$517,212**	**$445,986**	**$610,671**	**$558,655**	**$522,245**	**$588,609**	**$704,591**	**$869,042**	**$740,824**	**$875,859**	**$836,855**	**$934,225**	**$1,405,722**	**$1,061,263**	**$1,180,141**	**$1,366,502**	**$1,347,188**	**$1,964,184**	**$1,713,964**	***$18,243,737***

B. CAPITAL EXPENDITURE - SUMMARY

		Year	*0*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*18 YEAR TOTAL*
Activity		*Year end (July)*	*2009/10*	*2010/11*	*2001/12*	*2012/13*	*2013/14*	*2014/15*	*2015/16*	*2016/17*	*2017/18*	*2018/19*	*2019/20*	*2020/21*	*2021/22*	*2022/23*	*2023/24*	*2024/25*	*2025/26*	*2026/27*	*2027/28*	
1	**LANDFILL OPERATION - CURRENT FOOTPRINT & ACTIVITIES**																					
1.1	PURCHASE OF COMPACTOR	Compactor - secondhand machine identified by GBCartage - depending on new contract could require upfront payment of $141k or spread over term of say 7 years (modeled option). Required to extend existing life of landfill	$21,157	$21,157	$21,157	$21,157	$21,157	$21,157	$21,157													**$148,102**
1.2	PURCHASE OF DIESEL GENERATOR	31KVA Perkins powered Generator, Weather proof canopy, 400litre base fuel tank, 17626 engine hours, Converted to single phase	$9,548																			**$9,548**
1.3	HAZARDOUS WASTE STORAGE	Assumed retained on landfill footprint to reduce additional consenting requirements for new site.	$2,652																			**$2,652**
1	**Subtotal - LANDFILL OPERATION - CURRENT FOOTPRINT**		$33,358	$21,157	$21,157	$21,157	$21,157	$21,157	$21,157	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$160,302**
2	**LAND PURCHASE - Buffer Strip only**																					
2.1	DoC land purchase	Buffer strip a designation requirement, plus additional land purchased for RRC development. Estimated cost of buffer strip + RRC site is $50,000 (not confirmed via valuation). Buffer strip 24% of total area therefore purchase price assumed of $12,000. Area split based on 10950 m2 total size, 2654m2 buffer + 8296m2 extra. Refer email ES to MC 21/03/2008. Quantity evaluation advised.	$12,000																			**$12,000**
2	**Subtotal - LAND PURCHASE**		$12,000																			**$12,000**
		ANNUAL TOTAL CAPEX, assuming purchase of buffer strip goes ahead	**$45,358**	**$21,157**	**$21,157**	**$21,157**	**$21,157**	**$21,157**	**$21,157**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$172,302**
	C. REVENUE - FROM SALE OF RECYCLABLES																					
1	Estimated income	Based on BT estimates of current yield and value	-$ 7,044	-$ 7,255	-$ 7,473	-$ 7,697	-$ 7,928	-$ 8,166	-$ 8,411	-$ 8,663	-$ 8,923	-$ 9,191	-$ 9,466	-$ 9,750	-$ 10,043	-$ 10,344	-$ 10,654	-$ 10,974	-$ 11,303	-$ 11,642	-$ 11,992	**-$176,920**
		ANNUAL TOTAL SPEND, assuming expansion to adjacent land goes ahead, and specialist equipment is purchased	$555,526	$459,888	$624,355	$572,115	$535,474	$601,601	$717,337	$860,379	$731,901	$866,668	$827,389	$924,475	$1,395,679	$1,050,919	$1,169,486	$1,355,528	$1,335,884	$1,952,542	$1,701,972	**$18,239,119**
		NPV $/T	$433																			

GBI COSTINGS MODEL - ON ISLAND MAXIMUM SERVICES - DOC land purchased and RRC created, recyclables markets as per status quo **Revision: 12.05.09**

A. OPERATIONAL EXPENDITURE - SUMMARY & SPREAD

ASSUMPTIONS:

Annual Cost Adjustments

Average annual increase, based upon the Contract CPI rate - which is assumed will continue into the next Contract, and is also applied as an average annual increase to construction activities and plant outside of the disposal contract	8.5%
Assumed annual increase for supervision contract and other professional services (design, testing, survey etc.) + for inflationary incr. in recycling revenue rates:	3.0%
Assumed maintenance cost for purchased specialist plant (weighbridge, generator, compactor) - nominated % of capex	3.0%

		Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	18 YEAR TOTAL
Activity		*Year end (July)*	*2009/10*	*2010/11*	*20011/12*	*2012/13*	*2013/14*	*2014/15*	*2015/16*	*2016/17*	*2017/18*	*2018/19*	*2019/20*	*2020/21*	*2021/22*	*2022/23*	*2023/24*	*2024/25*	*2025/26*	*2026/27*	*2027/28*	
1	**LANDFILL OPERATION - CURRENT FOOTPRINT**																					
1.1	Contract - for management of landfill	Rollover from existing Contract in 2008 - includes for all ongoing opex costs relating to filling on the facility, capping, greenwaste and sandfilter.	$310,363	$336,744	$365,367	$396,423	$430,119	$466,679	$506,347	$549,387	$596,084	$646,752	$701,725	$761,372	$826,089	$896,306	$972,492	$1,055,154	$1,144,842	$1,242,154	$1,347,737	***$13,552,137***
1.2	Supervision - by Council staff	Island-based supervisor employed by ACC outside of GBCartage landfill operation contract ('eyes and ears')	$37,671	$40,873	$44,347	$48,117	$52,207	$56,645	$61,459	$66,683	$72,351	$78,501	$85,174	$92,414	$100,269	$108,792	$118,039	$128,072	$138,959	$150,770	$163,585	***$1,644,930***
1.3	Weighbridge - maintenance and other miscellaneous operating costs	Based upon a nominated percentage of capital cost ($100k)	$3,532	$3,832	$4,158	$4,511	$4,894	$5,310	$5,762	$6,252	$6,783	$7,360	$7,985	$8,664	$9,400	$10,199	$11,066	$12,007	$13,027	$14,135	$15,336	***$154,212***
1.4	Diesel Generator - maintenance and other miscellaneous operating costs	Based upon a nominated percentage of capital cost ($7k)	$247	$268	$291	$316	$343	$372	$403	$438	$475	$515	$559	$606	$658	$714	$775	$840	$912	$989	$1,074	***$10,795***
1.5	Monitoring	Undertaken six monthly	$11,176	$11,511	$11,856	$12,212	$12,578	$12,955	$13,344	$13,744	$14,157	$14,581	$15,019	$15,470	$15,934	$16,412	$16,904	$17,411	$17,933	$18,471	$19,026	***$280,694***
1.6	Annual Topographical Survey	Two out of every three years is a survey of the 12mth refuse placement, while every three years there is a more extensive survey and reinstallation of controls etc. It is assumed that the 3-yearly more extensive survey is one third more expensive than the standard survey.	$5,588	$3,837	$3,952	$6,106	$4,193	$4,318	$6,672	$4,581	$4,719	$7,291	$5,006	$5,157	$7,967	$5,471	$5,635	$8,706	$5,978	$6,157	$9,513	***$110,845***
1.7	SWAP survey (waste composition)	Assumed to take place every 3 years, starting 2008/09	$0	$0	$21,855	$0	$0	$23,881	$0	$0	$26,095	$0	$0	$28,515	$0	$0	$31,159	$0	$0	$34,049	$0	***$165,554***
1.8	Annual Operational Review / Performance Review	Assumed no cost - internal	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	***$0***
1.9	Refuse reports to ARC (six monthly)	Assumed no cost - internal	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	***$0***
1.1	Annual Report - to ARC	Assumed no cost - internal	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	***$0***
1.11	Car Bodies compaction and transport, plus Tyre disposal **overestimate to occur every 2yrs for first 4yrs, then every 5yrs thereafter	Occurs once every 2 yrs for 1st 2 years, then 5 yearly thereafter	$117,723	$0	$138,586	$0	$0	$0	$0	$208,386	$0	$0	$0	$0	$313,340	$0	$0	$0	$0	$471,156	$0	***$1,249,191***
1.12	Final Capping and Closing of cells - including grassing	Occurs after car bodies moved and then at say 3 year intervals. Note: base costs are total cost estimate for final capping, in 2007/08 dollars. Allowance made for annual cost increases when pricing three yearly capping	$0	$0	$0	$70,205	$0	$0	$91,601	$0	$0	$100,095	$0	$0	$109,377	$0	$0	$119,519	$0	$0	$130,602	***$621,399***
1.12a	Placement of initial cleanfill/soil layer - staged, portion laid every 3yrs	Assume soil is available from the site, placed and compacted at $5/m3 (2007/08 base rate)	$0	$0	$0	$5,961	$0	$0	$7,777	$0	$0	$8,499	$0	$0	$9,287	$0	$0	$10,148	$0	$0	$11,089	***$52,760***
1.12b	Clay supply and placement (track rolled to achieve permeability of 10-7) - staged, portion laid every 3yrs	Available on the island but supply dictated by roading work and local building projects. Assume 75% of clay is sourced as material for disposal (i.e. no cost to ACC) and remainder is imported at $10/m3. Assume $5m3 for placement and compaction. (2007/08 base rates)	$0	$0	$0	$17,882	$0	$0	$23,332	$0	$0	$25,496	$0	$0	$27,860	$0	$0	$30,444	$0	$0	$33,266	***$158,281***
1.12c	Topsoil (150mm depth as per OMP) - staged, portion laid every 3yrs	Not available on island so need to import. $20-30/m3 ex yard, so assume $50/m3 including transport and placement. (2007/08 base rates)	$0	$0	$0	$29,804	$0	$0	$38,887	$0	$0	$42,493	$0	$0	$46,434	$0	$0	$50,739	$0	$0	$55,444	***$263,801***
1.12d	Grass seeding (over 1.5Ha area) - staged, area grassed every 3yrs	Assume $5/m2 (2007/08 base rate)	$0	$0	$0	$16,558	$0	$0	$21,604	$0	$0	$23,607	$0	$0	$25,796	$0	$0	$28,188	$0	$0	$30,802	***$146,556***
1.13	Prepare landscaping plan	One-off	$15,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	***$15,000***
1.14	Landscaping - buffer zones	Planting and shaping	$0	$32,530	$3,377	$3,377	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	***$39,284***
1.14a	Supply and Planting	Assume $116/tree ($95/tree (1.5-2m) supply + $5 transport + $16/tree planting cost). Assume 1 tree per 2m, 550m buffer strip length - say 230 trees (2007/08 base rates)	$0	$29,154	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	***$29,154***
1.14b	Maintenance	$250/day x 1 day per month x 3yrs (2007/08 base rates)	$0	$3,377	$3,377	$3,377	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	***$10,130***
1.15	Consultancy Services	Additional consultancy services (to assist with new Disposal Contracts and/or Variations for the RRC etc.)	$15,914	$16,391	$16,883	$17,389	$17,911	$18,448	$19,002	$19,572	$20,159	$20,764	$21,386	$22,028	$22,689	$23,370	$24,071	$24,793	$25,536	$26,303	$27,092	***$399,697***
	Subtotal - Operational expenditure, landfill		$ 517,212	445986.1982	610670.7651	558655.0546	522244.747	588609.1075	704590.6219	869042.1939	740823.5362	875858.5975	836855.07	934225.3272	1405722.276	1061262.855	1180140.706	1366502.119	1347187.765	1964184.088	1713963.683	***$18,243,737***
3	**LANDFILL OPERATION - EXPANSION TO ADJACENT LAND**																					
3.1	Contract - additional costs for RRC	Additional staff (x1)	$30,900	$31,827	$32,782	$33,765	$34,778	$35,822	$36,896	$38,003	$39,143	$40,317	$41,527	$42,773	$44,056	$45,378	$46,739	$48,141	$49,585	$51,073	$52,605	***$776,111***
3.4	Glass Crusher trial- assume 2009/10 start	Optional pilot trial (t.b.c.), CSWL price of $25,815 for a 3mth trial (sufficient time to crush all stockpiled glass) (in today's dollars, annual inflation allowed for trials in coming years)	$30,390																			***$30,390***
3.5	Stockpiling of clay	Assume 2000 m3 per year at $2/m3for transport & placement + 5% CPI	$4,000	$4,200	$4,410	$4,631	$4,862	$5,105	$5,360	$5,628	$5,910	$6,205	$6,516	$6,841	$7,183	$7,543	$7,920	$8,316	$8,731	$9,168	$9,626	***$122,156***
3.6	Consents	Car crushing facility	$20,000																			***$20,000***
3.7	Consents	Septage	$30,000																			***$30,000***
3.8	Consents	RRP	$20,000																			***$20,000***
3.9	Consents	Clay stockpile	$10,000																			***$10,000***
3.10	Consents	Landfill - assume 50% of work completed in 2009/10 and rest in 2010/11 (assumed same cost each year)	$10,000	$10,000																		***$20,000***
3	**Subtotal - LANDFILL OPERATION - EXPANSION TO ADJACENT LAND**		$155,290	$46,027	$37,192	$38,396	$39,640	$40,927	$42,257	$43,632	$45,053	$46,523	$48,043	$49,614	$51,239	$52,920	$54,659	$56,457	$58,317	$60,241	$62,232	***$1,028,657***
4	**TRANSPORTATION OPERATIONS**																					
4.1	RECYCLING	Transportation via local truck driver at no cost to ACC	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	***$0***
4	**Subtotal - TRANSPORTATION OPERATION**		***$0***	***$0***	***$0***	***$0***	***$0***	***$0***	***$0***	***$0***	***$0***	***$0***	***$0***	***$0***	***$0***	***$0***	***$0***	***$0***	***$0***	***$0***	***$0***	***$0***
	ANNUAL TOTAL OPEX for Max. on-island - assumes expansion to adjacent land for RRC, and equipment trials proceed		**$672,502**	**$492,013**	**$647,863**	**$597,051**	**$561,885**	**$629,536**	**$746,847**	**$912,674**	**$785,877**	**$922,381**	**$884,898**	**$983,840**	**$1,456,962**	**$1,114,183**	**$1,234,799**	**$1,422,959**	**$1,405,505**	**$2,024,425**	**$1,776,195**	***$19,272,394***

B. CAPITAL EXPENDITURE - SUMMARY

		Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	18 YEAR TOTAL
Activity		*Year end (July)*	*2009/10*	*2010/11*	*20011/12*	*2012/13*	*2013/14*	*2014/15*	*2015/16*	*2016/17*	*2017/18*	*2018/19*	*2019/20*	*2020/21*	*2021/22*	*2022/23*	*2023/24*	*2024/25*	*2025/26*	*2026/27*	*2027/28*	
1	**LANDFILL OPERATION - CURRENT FOOTPRINT & ACTIVITIES**																					
1.1	PURCHASE OF COMPACTOR	Compactor - secondhand machine identified by GBCartage - depending on new contract could require upfront payment of $141k or spread over term of say 7 years (modeled option).	$21,157	$21,157	$21,157	$21,157	$21,157	$21,157	$21,157	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$148,102
1.2	PURCHASE OF DIESEL GENERATOR	31KVA Perkins powered Generator, Weather proof canopy, 400litre base fuel tank, 17626 engine hours, Converted to single phase	$9,548	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$9,548
1.3	HAZARDOUS WASTE STORAGE	Assumed retained on landfill footprint to reduce additional consenting requirements for new site (incl. 30% contingency). An average annual increase of 8.5% is applied to current rates.	$2,652	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$2,652
1	**Subtotal - LANDFILL OPERATION - CURRENT FOOTPRINT**		$33,358	$21,157	$21,157	$21,157	$21,157	$21,157	$21,157	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$160,302
2	**LANDFILL OPERATION - EXPANSION TO ADJACENT LAND**																					
2.1	PURCHASE & ENABLING WORKS FOR DOC LAND & RRC																					
2.1.1	DoC land purchase	Buffer strip a designation requirement, plus additional land purchased for RRC development. Estimated cost of buffer strip + RRC site is $50,000 (not confirmed via valuation). Buffer strip 24% of total area therefore purchase price assumed of $12,000. Area split based on 10950 m2 total size, 2654m2 buffer + 8296m2 extra. Refer email ES to MC 21/03/2008. Quantity evaluation advised.	$50,000																			$50,000
2.1.2	Consultancy - site valuation, iwi consultation, negotiations with DOC		$20,000																			$20,000
2.1.3	RRC enabling works	Replace and extend site perimeter fence, prepare new site area and access road, civils		$195,100																		$195,100
2.2	STOCKPILE AREA - FOR COVER & FINAL CAPPING MATERIAL	Preparation of area including sediment control			$16,500																	$16,500
2.3	CAR CRUSHING & STORAGE FACILITY	Require concrete pad and car stacking area			$124,600																	$124,600
2.4	RESOURCE RECOVERY FACILITY	Relocate recycling , set up of garage for reception/admin and maintenance and sale shop, set up bunkers for outdoor storage of recyclables				$89,700																$89,700
2	**Subtotal - LANDFILL OPERATION - EXPANSION TO ADJACENT LAND**		$70,000	$195,100	$141,100	$89,700	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$495,900
	ANNUAL TOTAL CAPEX, assuming expansion to adjacent land goes ahead, and specialist equipment is purchased		**$103,358**	**$216,257**	**$162,257**	**$110,857**	**$21,157**	**$21,157**	**$21,157**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	$656,202
C. REVENUE - FROM SALE OF RECYCLABLES																						
1	Estimated income	Based on BT estimates of current yield and value	-$7,044	-$7,255	-$7,473	-$7,697	-$7,928	-$8,166	-$8,411	-$8,663	-$8,923	-$9,191	-$9,466	-$9,750	-$10,043	-$10,344	-$10,654	-$10,974	-$11,303	-$11,642	-$11,992	
	ANNUAL TOTAL SPEND, assuming expansion to adjacent land goes ahead, and specialist equipment is purchased		$768,816	$701,015	$802,647	$700,211	$575,114	$642,527	$759,594	$904,011	$776,954	$913,191	$875,431	$974,089	$1,446,919	$1,103,839	$1,224,145	$1,411,985	$1,394,201	$2,012,783	$1,764,204	$19,928,596
		NPV $/T	$486																			

GBI COSTINGS MODEL - ON ISLAND MINIMUM SERVICES - DOC land purchased for buffer strip only, increased packaging and shipping off-island of recyclables, recyclables markets & revenue increased with additional off-island markets

Revision: 12.05.09

ASSUMPTIONS:

Annual Cost Adjustments

Average annual increase, based upon the Contract CPI rate - which is assumed will continue into the next Contract, and is also applied as an average annual increase to construction activities and plant outside of the disposal contract	8.5%
Assumed annual increase for supervision contract and other professional services (design, testing, survey etc.) + for inflationary incr. in recycling revenue rates:	3.0%
Assumed maintenance cost for purchased specialist plant (weighbridge, generator) - nominated % of capex	3.0%

B. OPERATIONAL EXPENDITURE - SUMMARY & SPREAD

		Year	*0*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*18 YEAR TOTAL*
Activity		*Year end (July)*	*2009/10*	*2010/11*	*20011/12*	*2012/13*	*2013/14*	*2014/15*	*2015/16*	*2016/17*	*2017/18*	*2018/19*	*2019/20*	*2020/21*	*2021/22*	*2022/23*	*2023/24*	*2024/25*	*2025/26*	*2026/27*	*2027/28*	
1	**LANDFILL OPERATION - CURRENT FOOTPRINT**																					
1.1	Contract - for management of landfill	Septage and greenwaste only, RTS created at site for sorting and storage of other wastes and recyclables prior to shipping off-island	$103,768	$112,589	$122,159	$132,542	$143,808	$156,032	$169,295	$183,685	$199,298	$216,238	$234,619	$254,561	$276,199	$299,676	$325,148	$352,786	$382,773	$415,308	$450,610	***$4,531,095***
1.2	Supervision - by Council staff	Island-based supervisor employed by ACC outside of GBCartage landfill operation contract ('eyes and ears') - supervisor for both remaining landfill activities and RTS	$37,671	$40,873	$44,347	$48,117	$52,207	$56,645	$61,459	$66,683	$72,351	$78,501	$85,174	$92,414	$100,269	$108,792	$118,039	$128,072	$138,959	$150,770	$163,585	***$1,644,930***
1.3	Weighbridge - maintenance and other miscellaneous operating costs	Based upon a nominated percentage of capital cost ($100k)	$3,532	$3,832	$4,158	$4,511	$4,894	$5,310	$5,762	$6,252	$6,783	$7,360	$7,985	$8,664	$9,400	$10,199	$11,066	$12,007	$13,027	$14,135	$15,336	***$154,212***
1.4	Diesel Generator - maintenance and other miscellaneous operating costs	Assumed still required for RTS operations	$247	$268	$291	$316	$343	$372	$403	$438	$475	$515	$559	$606	$658	$714	$775	$840	$912	$989	$1,074	***$10,795***
1.5	Monitoring	Undertaken 12 monthly - assumed to continue under closed landfill consent	$5,588	$5,755	$5,928	$6,106	$6,289	$6,478	$6,672	$6,872	$7,078	$7,291	$7,509	$7,735	$7,967	$8,206	$8,452	$8,706	$8,967	$9,236	$9,513	***$140,347***
1.6	Annual Topographical Survey	Not required once landfill is closed, initially survey only as part of closure works	$5,588																			***$5,588***
1.7	SWAP survey (waste composition)	Assumed to take place every 3 years, starting 2008/09 - for recyclables only	0	0	$ 14,570	0	0	15920.69729	0	0	17396.97578	0	0	19010.14516	0	0	20772.89889	0	0	22699.10748	0	***$110,370***
1.8	Annual Operational Review / Performance Review	Assumed no cost - internal																				***$0***
1.9	Refuse reports to ARC (six monthly)	not required once landfill is closed																				***$0***
1.1	Annual Report - to ARC	Assumed no cost - internal																				***$0***
1.11	Car Bodies compaction and transport, plus Tyre disposal **overestimate to occur every 2yrs for first 4yrs, then every 5yrs thereafter	Occurs once every 2 yrs for 1st 4 years, 5 yearly thereafter	$117,723	$0	$138,586	$0	$0	$0	$0	$208,386	$0	$0	$0	$0	$313,340	$0	$0	$0	$0	$471,156	$0	***$1,249,191***
1.12	Final Capping and Closing of cells - including grassing	Assumes capping of landfill takes place 'immediately', reducing ability to stockpile usable waste material rather (cleanfill, clay etc.) rather than import. Assume closure and cappings takes place over a 2 year period.	$187,629	$187,629																		***$375,259***
1.12a	Placement of initial cleanfill/soil layer - 2736m3	Assume 25% soil is available from the site for immediate closure, 75% sourced from mainland. Placed and compacted at $5/m3. Mainland purchase and shipping at $20/m3	$34,242	$34,242																		***$68,484***
1.12a	Clay supply and placement (track rolled to achieve permeability of 10-7) 5472m3 required	Available on the island but supply dictated by roading work and local building projects. Assume 25%sourced on-island at $10/m3 and remaining 75% imported from mainland ($10/m3 + transport). Assume $5m3 for placement and compaction. Shipping costs assumed to be $20/m3. (2007/08 base rates)	$97,319	$97,319																		***$194,638***
1.12b	Topsoil (150mm depth 1368 m3)	Not available on island so need to import. $20-30/m3 ex yard, so assume $50/m3 including transport and placement.	$36,044	$36,044																		***$72,088***
1.12c	Grass seeding (over 0.75Ha area)	Assume $5/m2.	$20,024	$20,024																		***$40,049***
1.12d	Prepare landscaping plan	one-off	$15,000																			***$15,000***
1.13	Landscaping - buffer zones	Planting and shaping	$0	$32,530	$3,377	$3,377																***$39,284***
1.14	Supply and Planting	Assume $116/tree ($95/tree (1.5-2m) supply + $5 transport + $16/tree planting cost). Assume 1 tree per 2m, 550m buffer strip length - say 230 trees		$29,154																		***$29,154***
1.12b	Maintenance	$250/day x 1 day per month x 3yrs		$3,377	$3,377	$3,377																***$10,130***
1.13	Consultancy Services	To assist with landfill closure (plan, consenting) and RTS establishment	$15,914	$16,391	$16,883	$17,389	$17,911	$18,448	$19,002	$19,572	$20,159	$20,764	$21,386	$22,028	$22,689	$23,370	$24,071	$24,793	$25,536	$26,303	$27,092	***$399,697***
1	**Subtotal - LANDFILL OPERATION - CURRENT FOOTPRINT**		$492,659	$399,868	$350,298	$212,358	$225,452	$259,205	$262,593	$491,887	$323,541	$330,669	$357,233	$405,018	$730,522	$450,956	$508,324	$527,204	$570,174	$1,110,596	$667,209	***$2,694,320***
4	**TRANSPORTATION OPERATIONS**	Transport by Truck to Tryphena - Ferry to Freemans Bay - Truck to Landfill																				
4.1	Disposal of refuse at Alternative landfill	$36 per tonne	$33,876	$36,247	$38,785	$41,500	$44,405	$47,513	$50,839	$54,397	$58,205	$62,280	$66,639	$71,304	$76,295	$81,636	$87,350	$93,465	$100,007	$107,008	$114,499	***$1,266,250***
4.2	Ferry Operation - Compactor Units (for refuse and recycling, including glass)	Continual operation using existing 2-3 trip per week ferry service. Compactor Hire Included	$235,836	$255,882	$277,632	$301,231	$326,836	$354,617	$384,759	$417,463	$452,948	$491,448	$533,222	$578,545	$627,722	$681,078	$738,970	$801,782	$869,934	$943,878	$1,024,108	***$10,297,889***
4	**Subtotal - TRANSPORTATION & DISPOSAL OPERATIONS**		**$269,712**	**$292,129**	**$316,417**	**$342,730**	**$371,240**	**$402,129**	**$435,598**	**$471,861**	**$511,153**	**$553,728**	**$599,861**	**$649,849**	**$704,017**	**$762,714**	**$826,320**	**$895,247**	**$969,941**	**$1,050,886**	**$1,138,606**	***$11,564,139***
		ANNUAL TOTAL OPEX	$762,372	$691,998	$666,714	$555,088	$596,692	$661,335	$698,191	$963,748	$834,695	$884,397	$957,093	$1,054,867	$1,434,539	$1,213,670	$1,334,644	$1,422,451	$1,540,115	$2,161,482	$1,805,815	***$20,239,905***

A. CAPITAL EXPENDITURE - SUMMARY

		Year	*0*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*18 YEAR TOTAL*
Activity		*Year end (July)*	*2009/10*	*2010/11*	*20011/12*	*2012/13*	*2013/14*	*2014/15*	*2015/16*	*2016/17*	*2017/18*	*2018/19*	*2019/20*	*2020/21*	*2021/22*	*2022/23*	*2023/24*	*2024/25*	*2025/26*	*2026/27*	*2027/28*	
1	**LANDFILL OPERATION - CURRENT FOOTPRINT, CONVERTED TO RTS WITH SOME ACTIVITIES CONTINUING (septage, greenwaste)**																					
1.1	RTS Capital Works	Based on Septage report. Costs for concrete pad, grade separation etc	$ 105,000																			***$105,000***
1.2	PURCHASE OF DIESEL GENERATOR	31KVA Perkins powered Generator, Weather proof canopy, 400litre base fuel tank, 17626 engine hours, Converted to single phase	$ 9,548																			***$9,548***
1.3	HAZARDOUS WASTE STORAGE	Assumed retained on landfill footprint to reduce additional consenting requirements for new site.	$ 2,652																			***$2,652***
1.4	DoC land purchase (Buffer Strip)	Buffer strip a designation requirement. Assumed 24% of $50,000 (not confirmed via valuation)	12000																			***$12,000***
	Annual total capex		$ 129,200	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	***$129,200***
C. REVENUE - FROM SALE OF RECYCLABLES			**0**																			
1	Estimated income	Based on BT estimates of current yield and value	-$ 69,369	-$ 71,450	-$ 73,594	-$ 75,802	-$ 78,076	-$ 80,418	-$ 82,830	-$ 85,315	-$ 87,875	-$ 90,511	-$ 93,226	-$ 96,023	-$ 98,904	-$ 101,871	-$ 104,927	-$ 108,075	-$ 111,317	-$ 114,657	-$ 118,096	***-$1,742,335***
		ANNUAL TOTAL SPEND, assuming expansion to adjacent land goes ahead, and specialist equipment is purchased	$822,203	$620,548	$593,121	$479,286	$518,617	$580,917	$615,360	$878,432	$746,820	$793,886	$863,867	$958,844	$1,335,635	$1,111,799	$1,229,717	$1,314,376	$1,428,798	$2,046,826	$1,687,719	***$18,626,771***
		NPV $/T		$448																		

GBI COSTINGS MODEL - RECOMMENDED SCENARIO - DOC land purchased incl. additional area for capping material stockpiling (but no RRC), compactor+generator purchased for improved operational efficiency/extended landfill life and hazardous waste storage area improved

Revision:
12.05.09

ASSUMPTIONS:

Annual Cost Adjustments	
Average annual increase, based upon the Contract CPI rate - which is assumed will continue into the next Contract, and is also applied as an average annual increase to construction activities and plant outside of the disposal contract	8.5%
Assumed annual increase for supervision contract and other professional services (design, testing, survey etc.) + for inflationary incr. in recycling revenue rates:	3.0%
Assumed maintenance cost for purchased specialist plant (weighbridge, generator, compactor, maintenance) - nominated % of capex	3.0%

B. OPERATIONAL EXPENDITURE - SUMMARY & SPREAD

		Year	*0*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*18 YEAR TOTAL*
Activity		*Year end (July)*	*2009/10*	*2010/11*	*20011/12*	*2012/13*	*2013/14*	*2014/15*	*2015/16*	*2016/17*	*2017/18*	*2018/19*	*2019/20*	*2020/21*	*2021/22*	*2022/23*	*2023/24*	*2024/25*	*2025/26*	*2026/27*	*2027/28*	
1	**LANDFILL OPERATION - CURRENT FOOTPRINT**																					
1.1	Contract - for management of landfill	Rollover from existing Contract in 2008 - includes for all ongoing opex costs relating to filling on the facility, capping, greenwaste and sandfilter.	$310,363	$336,744	$365,367	$396,423	$430,119	$466,679	$506,347	$549,387	$596,084	$646,752	$701,725	$761,372	$826,089	$896,306	$972,492	$1,055,154	$1,144,842	$1,242,154	$1,347,737	***$13,552,137***
1.2	Supervision - by Council staff	Island-based supervisor employed by ACC outside of GBCartage landfill operation contract ('eyes and ears')	$37,671	$40,873	$44,347	$48,117	$52,207	$56,645	$61,459	$66,683	$72,351	$78,501	$85,174	$92,414	$100,269	$108,792	$118,039	$128,072	$138,959	$150,770	$163,585	***$1,644,930***
1.3	Weighbridge - maintenance and other miscellaneous operating costs	Based upon a nominated percentage of capital cost ($100k)	$3,532	$3,832	$4,158	$4,511	$4,894	$5,310	$5,762	$6,252	$6,783	$7,360	$7,985	$8,664	$9,400	$10,199	$11,066	$12,007	$13,027	$14,135	$15,336	***$154,212***
1.4	Diesel Generator - maintenance and other miscellaneous operating costs	Based upon a nominated percentage of capital cost ($7k)	$247	$268	$291	$316	$343	$372	$403	$438	$475	$515	$559	$606	$658	$714	$775	$840	$912	$989	$1,074	***$10,795***
1.5	Monitoring	Undertaken six monthly	$11,176	$11,511	$11,856	$12,212	$12,578	$12,955	$13,344	$13,744	$14,157	$14,581	$15,019	$15,470	$15,934	$16,412	$16,904	$17,411	$17,933	$18,471	$19,026	***$280,694***
1.6	Annual Topographical Survey	Two out of every three years is a survey of the 12mth refuse placement, while every three years there is a more extensive survey and reinstallation of controls etc. It is assumed that the 3-yearly more extensive survey is one third more expensive than the standard survey.	$5,588	$3,837	$3,952	$6,106	$4,193	$4,318	$6,672	$4,581	$4,719	$7,291	$5,006	$5,157	$7,967	$5,471	$5,635	$8,706	$5,978	$6,157	$9,513	***$110,845***
1.7	SWAP survey (waste composition)	Assumed to take place every 3 years, starting 2008/09	$0	$0	$21,855	$0	$0	$23,881	$0	$0	$26,095	$0	$0	$28,515	$0	$0	$31,159	$0	$0	$34,049	$0	***$165,554***
1.8	Annual Operational Review / Performance Review	Assumed no cost - internal	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	***$0***
1.9	Refuse reports to ARC (six monthly)	Assumed no cost - internal	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	***$0***
1.1	Annual Report - to ARC	Assumed no cost - internal	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	***$0***
1.11	Car Bodies compaction and transport, plus Tyre disposal **overestimate to occur every 2yrs for first 4yrs, then every 5yrs thereafter	Occurs once every 2 yrs for 1st 2 years, then 5 yearly thereafter	$117,723	$0	$138,586	$0	$0	$0	$0	$208,386	$0	$0	$0	$0	$313,340	$0	$0	$0	$0	$471,156	$0	***$1,249,191***
1.12	Final Capping and Closing of cells - including grassing	Occurs after car bodies moved and then at say 3 year intervals. Note: base costs are total cost estimate for final capping, in 2007/08 dollars. Allowance made for annual cost increases when pricing three yearly capping	$0	$0	$0	$70,205	$0	$0	$91,601	$0	$0	$100,095	$0	$0	$109,377	$0	$0	$119,519	$0	$0	$130,602	***$621,399***
1.13	Prepare landscaping plan	One-off	$15,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	***$15,000***
1.14	Landscaping - buffer zones	Planting and shaping	$0	$32,530	$3,377	$3,377	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	***$39,284***
1.15	Consultancy Services	Additional consultancy services (to assist with new Disposal Contracts and/or Variations for the RRC etc.)	$15,914	$16,391	$16,883	$17,389	$17,911	$18,448	$19,002	$19,572	$20,159	$20,764	$21,386	$22,028	$22,689	$23,370	$24,071	$24,793	$25,536	$26,303	$27,092	***$399,697***
1	**Subtotal - LANDFILL OPERATION - CURRENT FOOTPRINT**		$517,212	$445,986	$610,671	$558,655	$522,245	$588,609	$704,591	$869,042	$740,824	$875,859	$836,855	$934,225	$1,405,722	$1,061,263	$1,180,141	$1,366,502	$1,347,188	$1,964,184	$1,713,964	***$18,243,737***
3	**LANDFILL OPERATION - EXPANSION TO ADJACENT LAND**																					
3.5	Stockpiling of clay	Assume 2000 m3 per year at $2/m3for transport & placement + 5% CPI	$ 4,000	$ 4,200	$ 4,410	$ 4,631	$ 4,862	$ 5,105	$ 5,360	$ 5,628	$ 5,910	$ 6,205	$ 6,516	$ 6,841	$ 7,183	$ 7,543	$ 7,920	$ 8,316	$ 8,731	$ 9,168	$ 9,626	***$ 122,156***
3.9	Consents	Clay stockpile	$ 10,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	***$ 10,000***
3	**Subtotal - LANDFILL OPERATION - EXPANSION TO ADJACENT LAND**		**$ 14,000**	**$ 4,200**	**$ 4,410**	**$ 4,631**	**$ 4,862**	**$ 5,105**	**$ 5,360**	**$ 5,628**	**$ 5,910**	**$ 6,205**	**$ 6,516**	**$ 6,841**	**$ 7,183**	**$ 7,543**	**$ 7,920**	**$ 8,316**	**$ 8,731**	**$ 9,168**	**$ 9,626**	***$ 132,156***
4	**TRANSPORTATION OPERATIONS**																					
4.1	RECYCLING	Transportation via local truck driver at no cost to ACC	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	***$ -***
4	**Subtotal - TRANSPORTATION OPERATION**		***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***
	ANNUAL TOTAL OPEX, assuming expansion to adjacent land goes ahead, equipment trials proceed but no Lime Stabilisation Facility		**$ 531,212**	**$ 450,186**	**$ 615,081**	**$ 563,286**	**$ 527,107**	**$ 593,714**	**$ 709,951**	**$ 874,671**	**$ 746,733**	**$ 882,064**	**$ 843,371**	**$ 941,067**	**$ 1,412,906**	**$ 1,068,805**	**$ 1,188,060**	**$ 1,374,818**	**$ 1,355,919**	**$ 1,973,352**	**$ 1,723,590**	***$ 18,375,893***

A. CAPITAL EXPENDITURE - SUMMARY

		Year	*0*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*18 YEAR TOTAL*
Activity		*Year end (July)*	*2009/10*	*2010/11*	*20011/12*	*2012/13*	*2013/14*	*2014/15*	*2015/16*	*2016/17*	*2017/18*	*2018/19*	*2019/20*	*2020/21*	*2021/22*	*2022/23*	*2023/24*	*2024/25*	*2025/26*	*2026/27*	*2027/28*	
1	**LANDFILL OPERATION - CURRENT FOOTPRINT & ACTIVITIES**																					
1.1	PURCHASE OF COMPACTOR	Compactor - secondhand machine identified by GBCartage - depending on new contract could require upfront payment of $141k or spread over term of say 7 years (modeled option).	$ 21,157	$ 21,157	$ 21,157	$ 21,157	$ 21,157	$ 21,157	$ 21,157	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$148,102**
1.2	PURCHASE OF DIESEL GENERATOR	31KVA Perkins powered Generator, Weather proof canopy, 400litre base fuel tank, 17626 engine hours, Converted to single phase	$ 9,548	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$9,548**
1.3	HAZARDOUS WASTE STORAGE	Assumed retained on landfill footprint to reduce additional consenting requirements for new site (incl. 30% contingency). An average annual increase of 8.5% is applied to current rates.	$ 2,652	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$2,652**
1	**Subtotal - LANDFILL OPERATION - CURRENT FOOTPRINT**		**$33,358**	**$21,157**	**$21,157**	**$21,157**	**$21,157**	**$21,157**	**$21,157**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$160,302**
2	**LANDFILL OPERATION - EXPANSION TO ADJACENT LAND**																					
2.1	PURCHASE & ENABLING WORKS FOR DOC LAND & RRC																					
2.1.1	DoC land purchase		$ 50,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$50,000**
2.1.2	Consultancy - site valuation, iwi consultation, negotiations with DOC		$ 20,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$20,000**
2.2	STOCKPILE AREA - FOR COVER & FINAL CAPPING MATERIAL		$ -	$ -	$ 16,500	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$16,500**
2	**Subtotal - LANDFILL OPERATION - EXPANSION TO ADJACENT LAND**		**$ 70,000**	**$ -**	**$ 16,500**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$86,500**
	ANNUAL TOTAL CAPEX, assuming expansion to adjacent land goes ahead, and specialist equipment is purchased		**$103,358**	**$21,157**	**$37,657**	**$21,157**	**$21,157**	**$21,157**	**$21,157**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$246,802**
C. REVENUE - FROM SALE OF RECYCLABLES																						
1	Estimated income	Based on BT estimates of current yield and value	-$ 7,255	-$ 7,473	-$ 7,697	-$ 7,928	-$ 8,166	-$ 8,411	-$ 8,663	-$ 8,923	-$ 9,191	-$ 9,466	-$ 9,750	-$ 10,043	-$ 10,344	-$ 10,654	-$ 10,974	-$ 11,303	-$ 11,642	-$ 11,992	$ -	**-$169,876**
	ANNUAL TOTAL SPEND, assuming expansion to adjacent land goes ahead, and specialist equipment is purchased		$627,315	$463,871	$645,041	$576,515	$540,098	$606,461	$722,445	$865,748	$737,543	$872,598	$833,620	$931,024	$1,402,562	$1,058,151	$1,177,086	$1,363,515	$1,344,277	$1,961,360	$1,723,590	$18,452,819
		NPV $/T	$441																			

GBI, Claris Landfill - Comparison of Waste Management Options - NPV assessment

Waste Management Option	Cost - NPV $ / T	Change from Status Quo
GBI COSTINGS MODEL - STATUS QUO - assumes purchase of buffer strip land from DOC, compactor+generator purchased for improved operational efficiency/extended landfill life and hazardous waste storage area improved)	$433	
GBI COSTINGS MODEL - ON ISLAND MAXIMUM SERVICES - DOC land purchased and RRC created, recyclables markets as per status quo	$486	12% increase
GBI COSTINGS MODEL - ON ISLAND MINIMUM SERVICES - DOC land purchased for buffer strip only, increased packaging and shipping off-island of recyclables, recyclables markets & revenue increased with additional off-island markets	$448	3% increase
GBI COSTINGS MODEL - RECOMMENDED SCENARIO - DOC land purchased incl. additional area for capping material stockpiling (but no RRC), compactor+generator purchased for improved operational efficiency/extended landfill life and hazardous waste storage area improved	$441	2% increase