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NATIONAL WASTE DISPOSAL SURVEY
FINAL REPORT

Prepared for Ministry for the Environment

March 2017

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Ministry for the Environment

National Waste Disposal Survey - Final Report

CONTENTS

LIST OF TABLES

APPENDICES

1 Introduction

1.1 Purpose

A provision of the Waste Minimisation Act 2008 (the Act) is a statutory review of the waste disposal levy (the levy) every three years. A key finding of the 2014 review[1] (the Review) was that the levy applied to an estimated 30 percent of all waste disposed to land. The Review recommended that the Ministry for the Environment (the Ministry) investigate making additional waste disposal sites subject to the levy.

The Ministry requires robust data on the number of non-levied landfills currently operating, as well as the volume and composition of the waste disposed at these sites, in order to quantify costs and benefits of extending the levy.

MWH has been commissioned by the Ministry to carry out a National Waste Disposal Survey (NWDS) to gather data.

1.2 Scope

The scope of work is as follows.

1. Expand and update the Ministry's data and information on waste disposed of at non-levied disposal sites. Data and information collected on non-levied disposal sites should include:
    - number and location of disposal sites
    - volume and composition of waste accepted
    - consent information where applicable
    - site operator and operation details
    - current gate fees/disposal charges ; and
    - classification of sites against the WasteMINZ disposal guidelines.

2. Provide a costed methodology for repeating data collection on non-levied disposal sites.

The NWDS involved operational, non-levied landfills. Farm dumps and permitted activity cleanfills were excluded from the scope of work.

The Ministry provided data sets prepared by Tonkin & Taylor (T&T 2014).

1.3 Interpretation

Landfill classification followed that presented in *Technical Guidelines for Disposal to Land* (WasteMINZ, 2016), referred to as the Guidelines.

For the purpose of this report, the following definitions should be used.

Landfill — means a landfill as defined in Resource Management (National Environmental Standards for Air Quality) Regulations 2004 i.e.

landfill means a site where waste is disposed of by burying it, or placing it upon land or other waste

[1] Ministry for the Environment. 2014. *Review of the effectiveness of the waste disposal levy, 2014 in accordance with section 39 of the Waste Minimisation Act 2008*. Wellington: Ministry for the Environment

Levied landfill means a disposal facility as defined in the Waste Minimisation Act 2008 i.e.

> **disposal facility** means—
> (a) a facility, including a landfill,—
> (i) at which waste is disposed of; and
> (ii) at which the waste disposed of includes household waste; and
> (iii) that operates, at least in part, as a business to dispose of waste; and
> (b) any other facility or class of facility at which waste is disposed of that is prescribed as a disposal facility

Non-levied landfill	means any landfill other than a levied landfill
Consented landfill	means a landfill for which a regional council has issued a discharge permit for the discharge of solid waste to land;
Non-consented landfill	means a landfill at which the discharge to land of waste is a permitted activity in a regional council plan; such a landfill may be consented by a territorial authority e.g. by way a land use permit
Operating landfill	means a landfill that is receiving waste for disposal
Closed landfill	means a landfill that no longer receives waste for disposal
Waste composition	Waste composition data in New Zealand comes from visual or sort-and-weigh surveys using the Solid Waste Analysis Protocol (SWAP) (MfE 2002). In the context of the NWDS, the term *waste composition* is used to characterise waste accepted at the different classes of landfill i.e.: Class 1 Municipal Landfill: municipal solid waste, industrial waste Class 2 Construction and Demolition Waste Class 3 Managed Fill Class 4 Cleanfill More detailed descriptions are provided in Appendix B.

References are presented in Appendix A.

2 Background

2.1 Review Recommendation

The NWDS was commissioned to assist the Ministry respond to a recommendation of the Review. This recommendations is as follows.

> **Recommendation Two**. Investigate making additional waste disposal sites subject to the levy obligations.
>
> **Context**
> The Act allows regulations to be made under section 41 prescribing any facility, or class of facility, as a disposal facility for the purposes of the Act, and therefore subject to the levy. The framework of the WasteMINZ Draft Technical Guidelines for Disposal to Land could be considered for defining the appropriate types of landfill according to the composition of the waste they accept; for example, Class 1 and/or Class 2 landfills, which accept wastes with a greater potential to cause harm than do cleanfills.

2.2 Review Priority and Structure

The Act sets out the purpose of the levy as:

- to raise revenue for promoting and achieving waste minimisation, and
- to increase the cost of waste disposal to recognise that disposal imposes costs on the environment, society and the economy.

The Review included statements as follows.

> In undertaking a review the Minister must consider whether, since the last review, the amount of waste disposed of has decreased, and whether the amount of waste reused, recycled or recovered has increased.
>
> The first priority for this review is to determine whether the levy is being applied correctly and equitably, and what needs to be done to ensure a level playing field for those who have obligations to pay the levy.

2.3 Review Findings

The Review was structured under the headings of “Levy administration and application”, “Levy expenditure”, “Cost of waste disposal”, and “Achieving waste minimisation”.

The findings in the Review that have been selected as having application to the NWDS are summarised as follows.

Part 1: Levy administration and application

The Review suggested that, based on the data collected, the levy is being applied to an estimated 30 percent of all waste disposed to land and commented that this relatively narrow application allows the potential for operators to minimise or avoid levy obligations and means the incentive effect of the levy is limited.

The Review states that application of the levy only to landfills that accept household waste (i.e. disposal facilities as defined in the Act) “was a pragmatic one to ensure ease of implementation, and the intent was to make other landfills subject to the levy over time”.

The Review states that:

> The levy was never intended to apply exclusively to household waste, but was applied to landfills that accept household waste as a starting point. Information gathered through the review supports consideration being given to extending levy obligations to additional waste disposal sites, to reduce opportunities for levy avoidance and provide greater incentives for waste minimisation.

Part 3: Cost of waste disposal

The Review includes the following statements.

> …. that as much as 70 per cent of waste being disposed of to land is estimated to be at facilities that fall outside of the definition of disposal facility, and are not subject to levy obligations. Therefore, the cost of disposal has likely not increased for the majority of waste, and many waste generators are receiving no direct incentive from the levy to minimise waste".
>
> Making additional waste disposal sites subject to levy obligations would allow a greater proportion of waste generators to receive the waste minimisation incentive from the levy
>
> Applying the levy only to facilities that accept household waste risks providing operators with unintended opportunities to minimise or avoid levy obligations.

Part 4: Achieving waste minimisation

The Review includes the following statement.

> Overall waste disposal to levied disposal facilities has not decreased since the last review of the levy in 2011. Between the first full year of levy data (2010) and the time of reporting, disposal at levied facilities increased overall by 6 per cent. This was slightly less than GDP growth over the same period. However, because reliable data is only available on an estimated 30 per cent of total waste disposal to land, it is not possible to conclude whether total waste disposal has changed.

2.4 Application to Survey

Given the findings of the Review, further information is needed about:

- quantities of waste going to non-levied landfills
- waste composition and classification of landfills in terms of the Guidelines
- monitoring changes in quantities of waste being disposed at non-levied landfills.

3 Methodology

The overall methodology of updating the Ministry's existing database for operational, non-levied landfills comprised:

1. gathering information using questionnaire surveys
2. gathering information from selected landfill site surveys, and
3. reporting.

The costed methodology (MWH 2017) for repeating the gathering of data about non-levied landfill was prepared after the questionnaire surveys and landfill site surveys were carried out.

The objective of the questionnaire surveys and landfill surveys was to gather data and information in order to update the Ministry's landfill database with respect to:

- number and location of disposal sites
- volume and composition of waste accepted
- quantities of waste coming to the sites and the types of vehicles delivering waste and the activities that have generated the waste
- consent information where applicable
- site operator and operation details
- current gate fees/disposal charges, and
- classification of sites using the Guidelines.

The methodology was implemented in stages as follows.

1. **Survey development**

   i. Review the Ministry's current non-levied landfill database (the landfill database).
   ii. Develop questionnaires for regulatory authorities and landfill operators.
   iii. Develop a landfill site survey methodology.

2. **Data acquisition**

   i. Issue questionnaires and update the landfill database.
   ii. Identify landfill sites for site survey and obtain permissions from selected operators.

3. **Data verification**

   i. Prepare survey schedule and logistics.
   ii. Undertake site surveys.
   iii. Data check and review.

4. **Reporting and reviews**

   i. Prepare report.
   ii. Prepare costed methodology.

Further information about NWDS methodology is given in Appendix C.

4 Results

4.1 Overview

The results of the NWDS are presented in terms of:

- the updated landfill database; and
- the results of the landfill surveys.

The updated landfill database contains information fields designed to efficiently record the data sought by the Ministry. The landfill database needs to enable the Excel spreadsheets to be used for a future mail merge issue of questionnaires to landfill operators either by email or post, and to analyse data using the spreadsheets (e.g. numbers of landfill, quantities of waste).

Information about the landfill data base provided by the Ministry and the updated database is provided in Appendix D The landfill database is presented as Appendix E. This is a separate electronic document *MfE Landfill Database_master list*_v7.xlsx.

4.2 Landfill Database

4.2.1 Introduction

The landfill database was analysed for the following information which was sought by the Ministry, namely:

- numbers and locations of disposal sites
- volume and composition of waste accepted
- consent information where applicable
- site operator and operation details
- current gate fees/disposal charges, and
- classification of site against WasteMINZ landfill classification system.

4.2.2 Numbers and Locations of Disposal Sites

Updating the landfill database was based predominantly on regional council responses. The numbers of disposal sites in regions determined as part of the NWDS are presented in Table 4-1. The landfills recorded are non-levied, consented landfills. This record does not include landfills permitted under regional plans, which includes farm landfills and may include cleanfills. The record also does not include landfills that are consented under district plans but are permitted under regional plans.

The landfill database records the numbers of non-levied landfills in districts where this information is known. These numbers are not included in the report because of the large number of districts and the large number of landfills for which a district location is not known.

Table 4-1: Non levied, consented landfills

Region	Non-levied, consented landfills
Northland	10
Auckland	94
Waikato	23
Bay of Plenty	30
Taranaki	33
Gisborne	4
Hawke's Bay	13
Horizons	20
Wellington	15

Region	Non-levied, consented landfills
Tasman	7
Nelson	14
Marlborough	17
West Coast	19
Canterbury	47
Otago	10
Southland	25
Chathams	0
Total	**381**

Tonkin & Taylor (2014) reported a total of 1,048 landfills, of which 264 were open, 460 were closed and 324 were of unknown status. These landfills included consented and permitted, non-levied landfills both operating and closed.

The Review recorded an expected outcome of the waste disposal levy as people disposing of less waste. A possible indicator of this would be a reduction in the number of consented, non-levied landfills. Thus, Table 4-2 compares the numbers of landfills in each region determined by Tonkin & Taylor to the numbers determined by the NWDS. The right hand column (column 7) records the difference between the total number of landfills reported by Tonkin and Taylor (both open landfills and landfills of unkown operating status) and the total number deteremined by the NWDS. A positive number means the number of landfills has increased and a negative number means the number has decreased.

Table 4-2: Comparison of Results

Region	T&T database	T&T database	T&T Database	Updated Database	Updated Database	Updated Database	Difference
	open	unknown	Col 1 + 2	open	unknown	Col 4 + 5	Col 6 – 3
Column no.	*1*	*2*	*3*	*4*	*5*	*6*	*7*
Northland	6	0	6	10	0	10	4
Auckland	22	124	146	94	0	94	-52
Waikato	48	26	74	5	18	23	-51
Bay of Plenty	27	2	29	30	0	30	1
Taranaki	35	1	36	33	0	33	-3
Gisborne	2	2	4	1	3	4	0
Hawke's Bay	3	18	21	4	9	13	-8
Horizons	2	28	30	5	15	20	-10
Wellington	16	28	44	15	0	15	-29
Tasman	6	1	7	7	0	7	0
Nelson	6	6	12	14	0	14	2
Marlborough	11	11	22	17	0	17	-5
West Coast	11	10	21	19	0	19	-2
Canterbury	38	44	82	47	0	47	-35
Otago	6	16	22	10	0	10	-12
Southland	25	7	32	25	0	25	-7
Chathams	0	0	0	0	0	0	0
Total	**264**	**324**	**588**	**336**	**45**	**381**	**-207**

Overall, the number of consented, non-levied landfills of known or unknown operating status has dropped by 207, or 35%. However, the number of consented, non-levied landfills of known operating status has risen by 72 and the number of consented, non-levied landfills of unknown operating status decreased by 279. This indicates significantly greater confidence in the known number of operating consented, non-levied landfills.

In Northland, Bay of Plenty, and Nelson regions, there have been increases in the numbers of non-levied, consented landfills, respectively 67%, 3% and 17% on those reported by Tonkin & Taylor.

In Gisborne, Tasman and Chathams there have been no changes in the numbers of non-levied consented landfills.

In all other regions, numbers of non-levied consented landfills are less than reported by Tonkin & Taylor. The largest reductions have been in the Auckland (52 or 36% decrease), Waikato (51 or 69% decrease), Wellington (29 or 66% decrease), and Canterbury (35 or 43%) regions. These regions, and the Horizons region, were reported (T&T 2014) as having the highest number of landfills of unknown status. Thus, the reductions may be largely a result of landfills previously reported as unknown status (T&T 2014) being determined as closed landfills during the NWDS. Also, permitted activity landfill numbers reported previously (T&T 2014) may account for some reductions in the numbers of landfills.

Regional plan and district plan rules are expected to affect the numbers of unlevied, consented landfills. Tonkin & Taylor (2014) reported a summary of regional rules, with some regions allowing cleanfills as permitted activities subject to conditions and others not allowing this. A definition of cleanfill material was provided by the Ministry (2002[2]). This definition covers waste types for Class 3 and class 4 landfills. A review of regional and district plan rules has not been undertaken as part of the NWDS. It is noted that the Guidelines replace *A Guide to the Management of Cleanfills* (MfE, 2002)

4.2.3 Volume and Composition of Waste Accepted

Data Sources

The landfill database was updated using quantity and composition information either provided by regional councils directly from resource consents provided by regional councils, and using the results of the site surveys. Otherwise, information from the original database was retained.

The Review recorded that information on waste quantities and composition reported by Tonkin & Taylor (2014) was based on the resource consents or regional rules. In order to obtain a perspective on how many consented, non-levied landfills are regulated in terms of waste quantities, the database was analysed for this information. The results are presented in the landfill database. In summary, points are as follows.

- Only 14% of the landfills in the database have a consented filling rate (i.e. 54 landfills out of 381 landfills in the database).
- 8 out of 16 regions had consents with filling rates (the Chatham Islands has no consented, non-levied landfills).
- The Auckland region has the highest proportion of landfills with a consented filling rate, with 38% of landfills in the region reported as having a consented filling rate.

Tonkin & Taylor reported that actual filling rates were obtained for only 6 landfill sites. During the NWDS, filling rate information was obtained for the 13 landfills at which site surveys were undertaken.

[2] MfE 2002, A Guide to the Management of Cleanfills

Waste Quantities

The consented disposal rates were analysed in order to determine a median consented disposal rate.

The methodology for determining the median values was as follows.

i. Consented filling rates are recorded in terms of the volume of waste disposed per year (i.e. m^3/yr).
ii. The median filling rates were determined for regions where there was information to do so (i.e. 8). For 4 of these regions, there was only one landfill in each with a consent limit on the landfill filling rate.
iii. The median was taken as a better measure of a mid-point as the average value has the disadvantage of being affected by any single value being too high or too low compared to the rest of the sample.
iv. The median disposal rates for regions ranged from 2,000 m^3/yr. to 18,000 m^3/yr.
v. In order to convert volumetric filling rates to filling rates in tonnes per year, typical waste densities were used. The waste density of a municipal landfill is commonly reported as approximately 0.9m^3/tonne. The waste density of a cleanfill has been reported as 1.4m^3/tonne (T&T 2014). The density of a municipal landfill is lower than a cleanfill because it has a lower proportion of high density waste such as soil, rock and other inert materials.
vi. The lower density is typically more applicable to Class 1 and Class 2 landfills and the higher density more applicable to Class 3 and Class 4 landfills. Class 2 and Class 3 landfills may have lower densities (e.g. woodwaste landfills) or higher densities (e.g. eggshells).
vii. Thus, based on the densities in (v) above, indicative median filling rates are in the range of 2,000 t/yr. to 25,000 t/yr.

Given that information about filling rates was not available for 82% of consented, non-levied landfills, any estimation of total waste quantities disposed nationally using the available information was considered inappropriate because it may misrepresent the situation.

Waste Composition

The Guidelines provide a landfill classification system based on waste composition. The system comprises 4 classes of landfill. A class 1 landfill receives waste materials with the highest risk of environmental contamination and a class 4 landfill receives waste materials with the lowest risk of environmental contamination. Class 2 and 3 landfills have in-between risks.

Landfills have been classified using information about materials permitted for disposal in the resource consents and the results of the site surveys. Further information about this classification system and survey results is presented in 4.2.7.

4.2.4 Consent Information Where Applicable

Consent information recorded in the landfill database comprises:

- Site Name / Address
- Easting
- Northing
- Landfill Classification (Class 1, 2, 3 or 4)
- Operator name/ contact details
- Consent Number
- Consented quantity
- Consented amount as annual quantity (m^3 per year)
- Materials permitted.

If a copy of a consent was obtained from a regional council, the landfill database records this.

Approximately 40% of the landfills on the database have updated information for site name/ address, landfill classification, operator's name, consent numbers and materials permitted for disposal. There have been few if any updates in the other fields.

4.2.5 Site Operator and Operation Details

Site Operator and Operation Details recorded in the landfill database comprise:

- Site operator details
  - Site Name / Address
  - Operator name/ contact
- Operation details
  - waste material types disposed
  - quantities of waste materials disposed
  - hours of operation.

Site operator details were sought from operators during the site surveys. With the exception of the Auckland Region, the database would benefit from a comprehensive update of operator contact details.

4.2.6 Current Gate Fees/Disposal Charges

The landfill database (T&T 2014) had a gate fees field for landfills in some regions. There were few entries. Gate fee information was not provided in response to the questionnaire surveys, although it was sought. Current gate fees or disposal charges were sought during the site surveys. An indicative fee was provided for 1 of the 13 sites surveyed. At the other sites there were no fees or the fees were confidential.

The updated database does not have a field for gate fees.

4.2.7 Classification of Sites

Sites have been classified using the classification system in the Guidelines. A summary of the system is presented in Table 4-3. Further information is given in Appendix B.

Table 4-3: Landfill Classification

Class	Common Name	Waste Description	Material source
1	Municipal Solid Waste Landfill	Clean Fill Material, Managed Fill Material, C&D Waste, Municipal Solid Waste, Household Waste, Commercial Waste, Industrial Waste, Treated Hazardous Waste	Mixed municipal waste from residential, commercial and industrial sources.
2	Construction and Demolition Waste Landfill	Clean Fill Material, Managed Fill Material, C&D Waste, Non-putrescible Industrial Waste	As per Class 4 and 3 landfills and also including non-putrescible organic material such untreated and treated sawn timber; · wallpaper, lining paper and building paper. Maximum incidental or attached biodegradable materials (e.g. vegetation) to be no more than 5% by volume per load.
3	Controlled fill	Clean Fill Material, Managed Fill Material	As per Class 4 landfills and also including manufactured inert materials. Maximum incidental or attached biodegradable materials (e.g. vegetation) to be no more than 2% by volume per load.
4	Cleanfill	Clean Fill Material	Non-contaminated soils, rocks, gravel, sand, clay and other natural materials.

The class of a landfill in the landfill database was first determined on the basis of the types of waste materials approved for disposal in the resource consent. The database was then updated with the landfill class determined using information from the site surveys.

The results are presented in Table 4.4.

Table 4-4: Numbers of Non-levied, consented Landfills by Landfill Class

Region	Class 1	Class 2	Class 3	Class 4	Unknown	Total
Northland	0	2	1	5	2	10
Auckland	0	0	21	73	0	94
Waikato	0	1	4	0	18	23
Bay of Plenty	1	13	5	0	11	30
Taranaki	3	1	27	1	1	33
Gisborne	2	2	0	0	0	4
Hawke's Bay	0	3	1	0	9	13
Horizons	0	12	5	0	3	20
Wellington	0	4	2	1	8	15
Tasman	0	0	3	0	4	7
Nelson	0	0	6	0	8	14
Marlborough	0	0	17	0	0	17
West Coast	0	1	6	1	11	19
Canterbury	0	1	20	0	26	47
Otago	2	0	6	0	2	10
Southland	1	6	15	0	3	25
Chathams	0	0	0	0	0	0
Total	**9**	**46**	**139**	**81**	**106**	**381**
	2%	12%	36%	21%	28%	100.00%

The results indicate that most (36%) non-levied consented landfills are Class 3 landfills, with the next highest percentage of landfills with a class being Class 4 landfills (21%). Combined these two classes comprise 57% of all of the non-levied, consented landfills. Class 1 landfills and Class 2 landfills were respectively 2% and 12% of the total number of landfills. A landfill class was not assigned to 28% of the landfills because there was not the information to do.

The numbers of operating non-levied, consented landfills are illustrated in Figure 4-1.

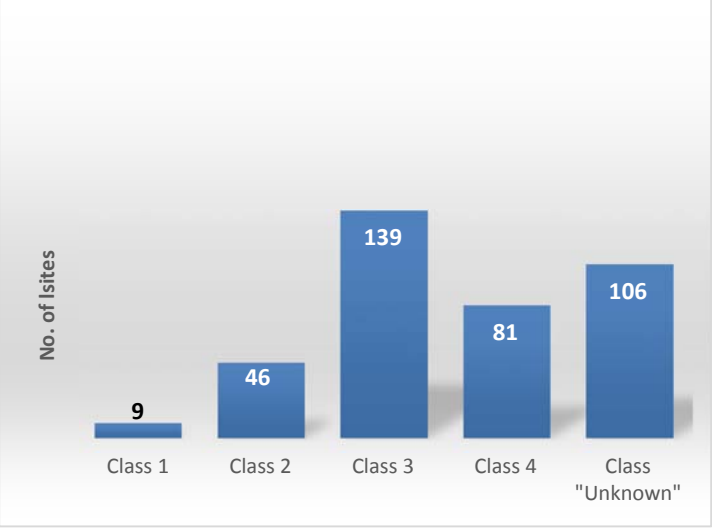

Figure 4-1: Operating, non-levied, consented landfills

The numbers of operating non-levied, consented landfills as percentages by class are illustrated in Figure 4-2.

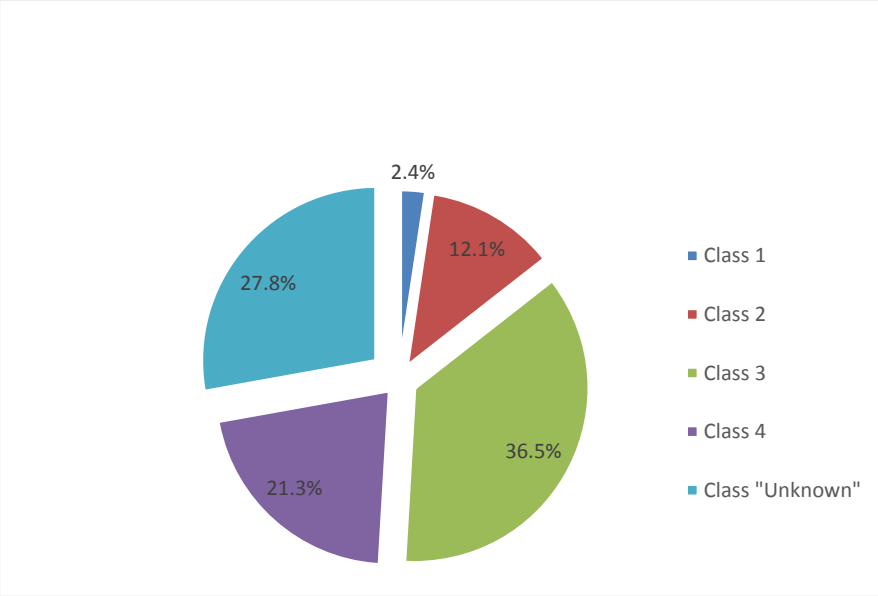

Figure 4-2: Proportions of Landfills by Class

The Review reported numbers of landfills known to be operating by class (from T&T 2014) as 32 Class 1 (12%), 46 Class 2 (17%), 5 Class 3 (2%) and 166 Class 4 (63%). 14 landfills were not classified. Compared with NWDS results, the most significant changes are the decrease in the proportion of Class 1 landfills (a reduction from 12% to 2%) and the increase in Class 3 landfills (up from 2% to 36%). The NWDS classified landfills of unknown operating status if there was information available to do so. Also, the classification as part of the NWDS was conservative in classifying any landfill referred to as a cleanfill as a Class 3 landfill unless there was information that indicated the cleanfill conformed to a Class 4 landfill as described in the Guidelines.

Possibly, the key result of the comparison is the apparent reduction in the numbers of Class 1 and Class 2 landfills.

4.3 Site Survey Results

Site surveys were carried out at 13 landfill sites. The NWDS method was that for undertaking visual surveys provided in the *Solid Waste Analysis Protocol* (SWAP), (MfE 2002).

Survey sites were selected so as to survey 5 Class 1 landfills, 4 Class 2 landfills, 3 Class 3 landfills and 1 Class 4 landfill. Details about the methodology of site selection are presented separately in the *Costed Methodology* (MWH, 2017).

Key findings from the site surveys are as follows.

- As a result of site surveys, the class of landfill was changed for 4 of the 13 sites (i.e. 31% of landfills changed class). The changes in landfill class were that:
    - the selected Class 4 site was changed to a Class 3 site because manufactured materials exceeded the Class 4 limit
    - one selected Class 3 site changed to a Class 1 site because the organics limit exceeded that for both a Class 3 site and a Class 2 site
    - two selected Class 2 sites changed to Class 1 sites because the organics limit exceeded that for a Class 2 site.

- The recovery of materials for reuse or recycling was not practiced at any of the sites surveyed.
- The estimated median quantity of waste disposed at the 13 sites was 42,000 tonnes / year. This was based on converting the estimated volumes per day to tonnes per day, and extrapolating the daily quantities to annual quantities. The median quantity determined by region using consent conditions (refer to 4.2.3) ranged from 2,000 tonnes/year to 25,000 tonnes/year. Thus, NWDS results indicate that the median rate of disposal to non-levied, consented landfills is significantly greater than the rate determined on the basis of consented maximum disposal rates.
- Disposal fees were indicated only for one of the sites. 7 of the sites were private and used for company waste only and any disposal fees were an internal company charge. Waste disposal charges at 4 of the sites were available only to account holders and gate fees or charges were not provided. At one site there was no charge for disposal.

The landfill database has been updated with results from the site surveys. Whilst the number of landfills surveyed is only 3% of the total number of sites recorded in the database, the results indicate that the number of Class 1 sites and Class 3 sites may be underestimated with a corresponding over estimate of number of Class 4 sites and Class 2 sites.

A summary of NWDS results is presented in Appendix F.

The site surveys analysis document is Appendix G, which is a separate document. The site survey reports are given in Appendix H.

5 Data Limitations

5.1 Data Format

The format of the spreadsheets in the landfill database was changed so as to have the same number of data fields for each spreadsheet (except for Auckland, which has additional council-supplied information) and to enable use of selected data fields for mail merge issue of questionnaires.

Information from various sources and forms has been entered to the landfill database. Information sources include:

- the landfill database provided by the Ministry in Excel format
- hardcopy consents and electronic files provided by regulatory authorities
- information from the landfill surveys
- email communications with regulatory authorities
- telephone communications with regulatory authorities.

Copies of resource consents provided by regulatory authorities have been saved on the MWH electronic filing system and will made available upon request.

5.2 Data Entry

The reformatted landfill database was updated using information provided by regional councils and territorial authorities in response to the questionnaire surveys. When information was not available to update the landfill database, the original information was retained in a form consistent with the reformatted landfill database.

There are 381 sites recorded on the landfill database. Landfills confirmed as being operational non-levied, consented landfills total 336 and those not confirmed as operational total 45. Information in cells was kept to a minimum to assist with landfill database analysis and to enable mail merge of addresses.

5.3 Data Limitations

Limitations on the landfills database are as follows.

- The database records non-levied, consented landfills.
- The database does not record levied landfills, and permitted activity landfills (including farm dumps).
- The database does not record illegal landfills.
- The database builds on that prepared by Tonkin & Taylor (T&T, 2014) using information that has been provided predominately by regional councils.
- Email addresses are recorded comprehensively only for landfill operators in the Auckland Region; otherwise there are few email addresses for landfill operators.
- Postal addresses for landfill operators are limited and inadequate for a comprehensive postal questionnaire survey.
- The database records the consented capacity of a landfill, the consented disposal rate of a landfill or both where this information was available.
- The database does not record measured disposal rates.
- The class of each landfill has been determined initially on the basis of the materials permitted for disposal in the consent and then, for those sites at which surveys were undertaken, changed if NWDS results required this.

5.4 Cleanfills

Regional councils and territorial authorities regulate landfills through regulations in regional plans and district plans promulgated under the Resource Management Act 1991.

Regulations and definitions vary amongst regions and territories. In particular, regulations and defintions for cleanfill vary. A common definition of cleanfill is that provided by the Ministry (MfE 2002), which describes acceptable material and conditionally acceptable material for disposal at a cleanfill. The descriptions of acceptable material for a cleanfill is similar to material suitable for disposal in a Class 3 landfill or Class 4 landfill in the Guidelines. The description of some conditionally acceptable material for a cleanfill (eg timber) is similar to the description of material required to be disposed in Class 2 landfill in the Guidelines. The Ministry's definition of cleanfill or conditionally acceptable material is qualitative. This gives rise to a need for interpretation by regulators and operators, although some regulators provide quantitative conditions in permitted activity rules.

A cleanfill may be permitted in terms of a discharge of waste to land yet require a resource consent for an associated activity, such as a stormwater discharge or the movement of a quantity of material that exceeds a nominated threshold value. The definition of a consented landfill adopted for the NWDS is one for which a discharge to land permit for waste has been issued. Some responses to the questionnaire survey indicated that landfills have been recorded when a resource consent has been issued for an activity at the site of the landfill which is not that for the discharge of waste to land. Thus, different interpretations of the term 'consented landfill' are apparent.

A consequence of the above points is that the landfill database records some landfills suspected of being permitted landfills according to the definition adopted for the NWDS and possibly does not record many Class 3 and Class 4 landfills because these are interpreted as being permitted landfills. Farm landfills are not recorded and these could be landfills of any one of the four classes depending on the material disposed.

Thus, the numbers of Class 3 and Class 4 landfill sites and the quantities of waste disposed of at these sites is unknown.

5.5 Landfills

The definition of landfill given in the *Resource Management (National Environmental Standards for Air Quality) Regulations 2004* (i.e.. landfill means a site where waste is disposed of by burying it, or placing it upon land or other waste) is dependent on the interpretation of the term waste. Sites at which sludge is disposed exist and would be classified as landfills if sludge were interpretated as being a type of waste. A common type of sludge is that generated at wastewater treatment plants. Large landfills or monofils exist for the disposal of this material that are not recorded in the landfill database.

The *Guidelines for the Safe Application of Biosolids to Land in New Zealand* (WaterNZ 2003) state that "…biosolids are sewage sludges or sewage sludges mixed with other materials that have been treated and/or stabilised to the extent that they are able to be safely and beneficially applied to land."

The *Beneficial Use of Organic Waste Products on Land – Volume 1 Guide* Draft for Public Comment (WaterNZ 2016) states that:

> "This Guide applies to products made from organic waste materials or mixtures of organic waste materials that have been processed to make them safe for further use. Raw organic materials that are suitable to make these products include:
>
> - household organic wastes (food waste, green waste)
> - paper and cardboard
> - primary sector related organic wastes e.g. Agricultural wastes, Meat works wastes
> - manures
> - sewage sludge
> - pulp and paper waste
> - biodegradable nappies and sanitary items."

Given these definitions of materials that are applied to land, regulatory authorities when responding to the questionnaire survey may interpret such an application as not a constituting landfill even though the material could be or is defined as a type of waste.

The landfill database does not record some applications to land of sludge or biosolids material. Because such applications are high in biodegradable material, they would be classified as Class 1 landfills in terms of the Guidelines.

The landfill database may not record other applications of waste material to land that constitute landfills.

5.6 Analysis Limitations

The method of analysis of waste quantities (tonnes/year) given in the landfill database (Appendix E) is based on the consented waste disposal limits where these were available (46 of the 381 landfills).

The extrapolations of these quantities of waste to landfills to provide guidance on total quantities of waste discharged to non-levied, consented landfills regionally and nationally are considered precarious and therefore the results are not included in this report.

The results of the site surveys indicated a higher median landfill disposal rate than that used in the extrapolations.

Thus, the NWDS indicates that:

- the quantities of waste disposed to landfills are not reliably determined from resource consent conditions; and
- the actual quantities of waste being disposed to landfills may be significantly higher than indicated by the small proportion of landfills with resource consent conditions limiting waste quantities.

6 Key Findings

6.1 Introduction

The Review recommended that the Ministry investigate making additional waste disposal sites subject to the levy. In order to be able to quantity the costs and benefits of extending the levy, the Ministry commissioned the NWDS to assist gathering data on the number of non-levied, consented landfills currently operating, as well as the volume and composition of the waste disposed at these sites.

Key findings are thus focussed on: number of non-levied landfills, quantity of waste disposed, and composition of waste disposed.

6.2 Landfill Numbers

The number of non-levied consented landfills determined as a result of the NWDS was 381 with:

- 336 landfills being confirmed as open
- 45 landfills being of unconfirmed status.

This compares with the previous findings (T&T 2014) of:

- 264 landfills being confirmed as open
- 324 landfills being of unconfirmed status.

Thus, the number of landfills of known status has increased significantly (27%) and of unknown status decreased significantly (86%).

Whilst there is insufficient information to determine whether or not the overall number of landfills has increased or decreased, the landfill database more reliably records operating non-levied, consented landfills and this number has increased.

6.3 Waste Quantity

The quantity of waste being discharged to non-levied, consented landfills is regulated by way of a resource consent condition setting a maximum annual discharge rate for only 14% of the landfills. The available information indicated that eight regions do not issue consents with such a condition.

The median consent limit of waste quantity for the 54 landfills reported as having such limits was 7,000 t/yr approximately for Class 1 and Class 2 landfills and 11,000 t/yr approximately for Class 3 and Class 4 landfills (using landfills densities of respectively 0.9 t/m3 and 1.4t/m3).

The median quantity of waste for the 13 landfills surveyed was 42,000 t/yr, and most of these landfills were Class 1 and Class 2 landfills.

Thus, the waste quantity limits set by consent conditions are not a reliable indicator of typical quantities of waste being disposed at the landfills.

There is insufficient information in the landfill database to estimate the quantities of waste going to non-levied consented landfills.

The quantities reported by Tonkin & Taylor (T&T 2014) are expected still to be indicative of waste going to non-levied, consented landfills because the method used was based on correlating waste quantities with economic activity.

6.4 Waste Composition

Knowing the composition of waste disposed to a landfill assists in understanding:

- the risk to the environment of the waste being disposed; and
- the potential benefits of minimising the waste because either the risk to the environment is minimised directly by avoiding the waste or, instead of becoming waste, the material is reused, recycled or recovered and thus avoids or reduces adverse environmental effects associated, for example, with greenhouse gas emissions associated with the use of virgin materials.

This understanding would have significant effect in achieving the purpose of the levy if the levy were applied on the basis of waste composition rather than on the basis of waste source (i.e. that a landfill accepts household waste).

The composition of waste being discharged to non-levied, consented landfills can be assessed to some degree from conditions in resource consents. Such an assessment provides guidance in terms of risk of contamination as presented in the Guidelines. However, there is variability amongst regulatory authorities in defining types of landfills and setting conditions on composition of waste permitted for disposal at each type of landfill. This variability means that consent conditions provide only a loose guide to the risk of contamination and little or no guidance on the potential for utilising the material disposed for reuse, recycling or recovery.

The limitations of assigning a class to a landfill based on permitted waste in resource consent conditions and the Guidelines became apparent during the landfill surveys. Four out of the thirteen landfills surveyed (31%) changed class from a lower risk category to a higher risk category.

6.5 Further Findings

6.5.1 The Guidelines

The Guidelines classify landfills into four types of landfills based on the composition of waste material and its risk of contamination. A Class 1 landfill takes materials with the highest risk of contamination and a Class 4 landfills takes material with the lowest risk of contamination. Class 2 and Class 3 landfills take materials of intermediate risk.

The landfill classification system in the Guidelines is aligned with the purpose of the Act in that it is based on protecting the environment from harm. Applying the levy in the context of this landfill classification system would be aligned to a purpose of the levy in that the cost of waste disposal could be increased in proportion to the risk of harm.

6.5.2 Resource Consents

The information available from resource consents assists in classifying a landfill in terms of landfill class in the Guidelines. However, given the results of the site surveys, classifying landfills by resource consent information alone is likely to underestimate the numbers of Class 1 and Class 3 landfills.

Few consents have a condition setting a limit on the annual rate of waste discharge to land. The available information is insufficient to estimate quantities of waste being discharged to non-levied, consented landfills regionally or nationally.

6.5.3 Definitions

The Act states that "*household waste means waste from a household that is not entirely from construction, renovation, or demolition of the house*". Under the Act, a "*disposal facility*" is one that accepts household waste. Household waste is defined in terms of its source being a household rather than its composition and a disposal facility is determined on the basis of taking household waste and not necessarily the risk of contamination from the waste being disposed.

The risk of contamination from material disposed at a Class 1 landfill is not necessarily determined by whether or not household waste is accepted.

A review of the definition of *disposal facility* given in the Act is considered appropriate given the definition of a Class 1 landfill and the number of Class 1 landfills that do not fit the definition of a *disposal facility*.

The Guidelines use the term *biodegradable materials* as a type of material that differentiates landfill classes i.e. a Class 2 Landfill has a threshold on such material stated as *Maximum incidental or attached biodegradable materials (e.g. vegetation) to be no more than 5% by volume per load* and Class 3 landfill has a threshold of *2% by volume per load.* A Class 2 landfill can accept treated and untreated timber and other biodegradable material. Household or putrescible construction and demolition are excluded. Thus, the use of the term biodegradable in the Guideline is ambiguous.

In any review of the meaning a *disposal facility* and the application of the levy, and the use of the term *biodegradable materials* or similar to differentiate landfill types, a robust definition is needed and one that distinguishes a type of biodegradable material suitable for a Class 1 landfill and a type acceptable in a Class 2 landfill, or equivalent landfills.

6.5.4 Disposal Fees

The NWDS results indicated that disposal fees can be:

- an internal cost for a private landfill disposing of industry specific waste
- charges negotiated with account holders disposing waste at private landfills
- scheduled gate fees.

One surveyed site had no disposal fees.

Given the variability of fee structures and the confidentiality of fees in many instances, the benefit of including fees in the landfill database should be reviewed in terms of the cost and effectiveness of pursuing this information.

6.5.5 Levy Application

The Guidelines classify landfills in terms of their risk of contamination. A Class 1 landfill receives waste that poses the highest risk. A levied landfill (i.e. a disposal facility as defined in the Waste Minimisation Act 2008 is a Class 1 landfill. A Class 1 landfill, whether levied or non-levied poses a similar risk. The differentiating feature is that a levied landfill accepts household waste. This feature in itself is not a measure that distinguishes levied Class 1 landfills as posing greater a risk of contamination than non-levied Class 1 landfills. The Ministry (2014) reported 48 levied landfills and the NWDS identified 9 non-levied, Class 1 landfills.

Therefore, it is concluded that levying some Class 1 landfills and not others is inequitable.

A Class 2 landfill, in terms of the *Technical Guidelines for Disposal to Land* (WasteMINZ 2016), takes material that can contain biodegradable and leachable components and requires an engineered liner and leachate collection system. Given the risk of contamination by material that may go to a Class 2 landfill, extending the levy to include Class 2 landfills is considered consistent with the purpose of the Act, which includes "*protect the environment from harm*, and consistent with the purpose of the levy, which includes *increase the cost of waste disposal to recognise that disposal imposes costs on the environment, society and the economy.*"

The provisions of the Guidelines do not include a landfill liner for Class 3 and Class 4 landfills, which reflects the lower risk of contamination posed by material disposed at these landfills, as defined by the Guidelines.

Class 3 landfills do accept material that could be reused or recycled. The purpose of the Act includes encouraging waste minimisation. Also, given that a purpose of the levy includes "*increase the cost of waste disposal to recognise that disposal imposes costs on the environment, society and the eco*nomy, and *that use of reusable or recyclable"* can be a lower cost than use of virgin material, it is considered there is a case to investigate application of the levy to Class 3 landfills.

6.5.6 Climate Change Response Act

The Climate Change Response Act 2002 and regulations place requirements on operators of disposal facilities (as defined in the Waste Minimisation Act) to:

- collect and report this information from 1 January 2012
- surrender New Zealand Units (NZUs) to match their emissions.

The Climate Change (Waste) Regulations 2010 and Climate Change (Unique Emissions Factors) Amendment Regulations 2010 prescribe a methods of determining the quantity of emission units for the purpose of determining the number of NZUs to surrender.

The Amendment Regulations prescribe classes of waste and a unique emission factor for each class. These are presented in Table 6-1.

Table 6-1: Unique Emission Factors

Waste Class	Unique Emissions Factors
garden waste	1.26
nappy and sanitary waste	1.512
all putrescible waste other than garden waste	0.945
paper waste	2.52
sewage sludge	0.315
timber waste	2.709
textile waste	1.512

The regulations apply only to disposal facilities (i.e. levied Class 1 landfills). Waste types for Class 2 landfills include paper waste, timber waste and textile waste. The emission factors for these types of waste are respectively 2.52, 2.709 and 1.512, which are the three highest factors.

This indicates that Class 2 landfills could be high generators of emission as defined in the regulations. Another matter of equitability is that of levied Class 1 landfills being subject to both the levy and Climate Change Regulations yet non-levied Class 1 landfills and Class 2 landfills not being subject to either even though potentially the risk of contamination and the emission factors could be higher than a levied Class 1 landfill.

Appendices

Appendix A References

MfE 2002. *Solid Waste Analysis Protocol*

MfE. 2002. *A Guide to the Management of Cleanfills, Ministry for the Environment, January.* Beca Carter Hollings and Ferner Ltd.

MfE. 2011. *Consented Non-levied Cleanfills and Landfills in New Zealand, Ministry for the Environment, July 2011.*

MfE 2014. *Review of the effectiveness of the waste disposal levy, 2014*

MWH 2017. *National Waste Disposal Survey – Costed Methodology,*

SKM. 2010. *Waste Facilities Survey - Methodology and Summary of Results, Ver 3, 1July.*

T&T 2014. New Zealand Non-Municipal Landfill Database, January

WasteMINZ. 2016. Technical Guidelines for the Disposal to Land, April.

WaterNZ 2003, Guidelines for the Safe Application of Biosolids to Land in New Zealand

WaterNZ 2016 Beneficial Use of Organic Waste Products on Land – Volume 1 Guide Draft for Public Comment

Appendix B Landfill Classification

Sites have been classified using the classification system developed by WasteMINZ (2016). A summary of accepted waste types is presented as follows.

Class	Common Name	Waste Description	Material source
1	Municipal Solid Waste Landfill	Clean Fill Material, Managed Fill Material, C&D Waste, Municipal Solid Waste, Household Waste, Commercial Waste, Industrial Waste, Treated Hazardous Waste	Mixed municipal waste from residential, commercial and industrial sources, as well as: • soils, rocks, gravel, sand, clay etc., including those that do not meet the Class 4, 3, or 2 waste acceptance criteria. • road sweepings. • asbestos (disposed in accordance with the Asbestos Regulations 1998).
2	Construction and Demolition Waste Landfill	Clean Fill Material, Managed Fill Material, C&D Waste, Non-putrescible Industrial Waste	As per Class 4 and 3 landfills and also including: • plasterboard and Gibraltar board; • reinforced concrete; • untreated and treated sawn timber; • site clearance and excavation materials (including soils, clays, rocks, tree stumps); • roofing products (corrugated iron, steel, clay tiles, steel coated tiles); • fibreglass; • wallpaper, lining paper and building paper; • formica, laminex, parquet; • vehicle tyres, rubber (up to a maximum of 1% per load); • flooring products (carpet and underlay, vinyl/linoleum, cork tiles, clay tiles); • wire, wire rope, wire netting; • insulation products (fibreglass and woollen batts) excluding asbestos products and paper products; • textiles; • softboard, hardboard, particle board, plywood, MDF, customwood; • non-recyclable glass; • roading materials and asphalt; • non-recyclable steel and aluminium fittings (cable track, spouting); • plastic materials and items associated with construction and demolition activities (including plastic bags, pipes, • gutterings, building wrap); and • asbestos (disposed in accordance with the Asbestos Regulations 1998). Maximum incidental or attached biodegradable materials (e.g. vegetation) to be no more than 5% by volume per load.
3	Controlled fill	Clean Fill Material, Managed Fill Material	As per Class 4 landfills and also including: • soils, rocks, gravel, sand, clay etc. which do not meet the Class 4 WAC; • bricks, blocks and pavers; • ceramics; • concrete (exposed reinforcing removed); • road sub-base; • tiles and pipes made of clay, concrete or ceramics; and • asphalt. Maximum incidental or attached biodegradable materials (e.g. vegetation) to be no more than 2% by volume per load.
4	Cleanfill	Clean Fill Material	Non-contaminated soils, rocks, gravel, sand, clay and other natural materials.

Source: WasteMINZ 2016

Appendix C Survey Methodology

C.1 Overview

The overall methodology of updating the Ministry's existing database for non-levied waste disposal sites comprised:

1. gathering information using questionnaire surveys
2. gathering information from selected landfill site surveys, and
3. reporting.

In addition, the scope of work included preparing a costed methodology for repeating the gathering of data about non-levied waste disposal sites.

The objective of the questionnaire surveys was to gather data and information in order to update the Ministry's landfill database with respect to:

- number and location of disposal sites
- volume and composition of waste accepted
- consent information where applicable
- site operator and operation details
- current gate fees/disposal charges, and
- classification of sites using the WasteMINZ landfill classification system.

The objective of the landfill site surveys was to gather or verify site specific data and information, particularly about:

- the composition of waste accepted
- quantities of waste coming to the sites and the types of vehicles delivering waste and the activities that have generated the waste
- site operator and operational activities
- current gate fees/disposal charges, and
- better classification of sites using the WasteMINZ disposal to land classification system.

The implementing the methodology involved four milestone stages. Each milestone is described further in terms of activities undertaken and results in terms of implementing the methodology.

C.2 Milestone 1 Survey Development

Activities

Activities were:

i. reviewing the Ministry's current non-levied landfill database
ii. developing questionnaires for regulatory authorities and landfill operators
iii. developing landfill site survey methodology
iv. preparing Project Safety Plan and generic Job Safety Analysis form that can be adapted for individual sites.

Landfill Database

The T&T database contained operational and closed consented landfills, and permitted activity landfills. For the purpose of the NWDS, the database was modified so that it comprised one Excel workbook with spreadsheets recording operational landfills by local authority region.

Information about the T&T landfill database and the landfill database is provided in Appendix D.

Local Authority Questionnaire Package

A questionnaire was prepared for sending to each regional council and territorial authority. A regional council controls discharges, and either allows a discharge according to permitted activity rule or requires that a discharge be permitted using the resource consent process. A territorial authority controls land use and may control a landfill through one or more rules in its district plan.

The questionnaire was designed to request:

- advice about any landfills consented since the previous survey and a copy of the consents issued for each new landfill
- advice about any landfills that have closed
- advice about any audits or other activities carried out in relation to non-levied landfills, and the information gathered (where not provided with consents) including:
    - volume and composition of waste accepted
    - site operator and operation details
    - current gate fees/disposal charges, and
    - classification of sites using the WasteMINZ landfill classification system.

Each questionnaire package comprised:

- cover letter
- letter of verification from the Ministry
- a list of those landfills on the Ministry's database relevant to a regional council or territorial authority (TA)
- spreadsheets from database for each region or territory of each TA (with information other than landfill names removed)
- questionnaire.

The Ministry has provided its local authority contacts database. This was checked and updated by contacting councils.

Operators Questionnaire Package

A questionnaire was prepared for sending to the operator of each non-levied landfill on the landfill database. The questionnaire was designed to request:

- advice about any other non-levied disposal sites for which the operator is responsible
- methods of monitoring incoming waste (e.g. weighbridge, counter, other) and utilisation of site capacity (e.g. topographical surveys)
- schedule of accepted waste and unaccepted waste
- advice about the recycling or other waste minimisation activities carried out at the site
- quantity and composition of waste accepted at each site
- operating hours (day/week, hours/day)
- daily vehicle movements
- current gate fees/disposal charges.

Landfill Survey Methodology

The purpose of the methodology was to present a method for selecting landfill sites at which to undertake detailed data gathering.

A guiding principle in developing a method of site selection was taken as the potential to cause harm to the environment, noting the *Review of the effectiveness of the waste disposal levy*, 2014 (MfE, 2014) referred to the potential to cause harm in the Summary of Recommendations, recommendation 2.

The methodology of selecting and confirming survey sites involved:

1. preparing a list of potential sites based on:
    a. location of landfill
    b. size of operation (rate of waste disposal)
    c. landfill class
    d. reliability of information known about quantities and composition of waste.

2. applying a simple ranking system for survey site selection based on size of landfill operation and using an assessment of environmental harm indicator
3. contacting landfill operators with landfills shortlisted for survey
4. issuing example survey proforma (based on the using the Solid Waste Analysis Protocol (SWAP), MfE 2002) to inform the selected landfill operators
5. arranging site surveys with the confirmed non-levied landfill operators.

Site surveys were planned for 10 landfill sites.

The Site Survey Selection Methodology is detailed in a separate document, *National Waste Disposal Survey – Costed Methodology*, MWH 2017

C.3 Milestone 2 Data Acquisition

Overview

Activities were:

i. Sending questionnaire to regulatory authorities, assessing responses and updating the landfill database.
ii. Identifying landfill sites for visual SWAP site survey and obtaining permission from operators.

Questionnaire Surveys

Questionnaire packages were sent to all 17 regional councils by email. Following their issue, each council was contacted:

- to check the package had been received by the appropriate person
- to introduce them to MWH's request on behalf of the Ministry
- to make personal contact
- to discuss their timetable and logistics in providing the information requested.

14 Regional Councils responded with information, 2 did not respond, and 1 responded requiring payment for services (and further information from that council was not pursued).

Questionnaire packages were sent to 61 territorial authorities (i.e. territorial authorities that are not unitary authorities and contacted as regional councils). 10 responded with information and 51 did not respond.

The landfill database was updated upon receipt of responses from local authorities.

Following the local authority questionnaire stage, the landfill database remained incomplete with respect to contact details for operators. Given the large number of operating landfills in the database (over 500) and the need for correct addresses to enable survey implementation, the operator questionnaire packages were not issued.

C.4 Milestone 3 Data Verification

Overview

Activities were:

i. preparing the site survey schedule and logistics
ii. undertaking site surveys (10 sites initially, followed by a further 3 sites as described below)
iii. data checking and review.

Site Survey Schedule and Logistics

Following the preparation of a site survey template and in order to finalise the site survey procedures and test the template, a trial survey was carried out at an operational landfill. A site was selected which minimised travel. The landfill operator and the owner approved the trial and cooperated in achieving its purpose.

Site Surveys

All surveys were completed successfully with site operators cooperating in confirming survey dates and otherwise enabling MWH staff to carry out surveys. The first set of 10 surveys were completed within time, as there were no delays, and budget. Less time was used because the assessments of waste materials were made in three or less days and it was considered further observation time at sites would not add value.

With the available budget a further 3 sites were selected and approved for surveys. These were then completed and the results included in the landfill database.

Data Check and Review

Upon completion of surveys, data were checked and the database updated. Site survey data were analysed.

C.5 Comment on Methodology

Introduction

The implementation of the methodology revealed challenges which, although partly anticipated at the outset and recorded in a risk register at the start of the NWDS, modified what had been planned.

This section is intended to provide guidance in planning for any further database update.

Comment

Matters for attention at the planning stage of a further landfill database update are presented in Table C-1.

Table C-1: Planning Database Updates

	Milestone / Matter for Review	Strategy to mitigate
1	***Survey Development***	
	Define the purpose of the NWDS and determine specifically the data needed for this purpose. Determine whether or not the purpose would be better achieved with any modification of database structure.	The landfill database records 400 approximate landfills and 12 fields of information (and more for Auckland region) for each landfill. Maintaining the information as current and updating database is a significant investment. Reviewing information needs and minimising data requirements to meet the NWDS purpose has potential for significant savings in cost and time. The purpose of each database field should be documented in terms of the NWDS purpose.
	The methodology needs to be explicit in terms of achieving the purpose of the NWDS	An explicit methodology will enable more reliable NWDS planning in terms of costs and time. The methodology should have a quantitative mechanism for measuring progress in terms of achieving the NWDS purpose.
	Questionnaires need to be well-targeted to NWDS purpose	The information sought through the questionnaire surveys will relate to the NWDS propose and method of achieving the NWDS purpose. Questionnaires take time for recipients to read and respond to. Minimising the number of questions and making them readily understood will increase the number and quality of responses, and reduce costs particularly where charges for responding are imposed. A pilot survey may achieve good results in refining the questionnaires and the means of communicating the requests to recipients
2	***Data Acquisition***	
	Questionnaire surveys response time and quality of responses	A clear timeframe for responses is needed. Factors that may reduce response time are: readily understood and concise questionnaires; confirming contacts prior to issue; investing in follow up phone calls with contacts and, if necessary, going through questionnaires with them (i.e. filling out questionnaires via phone discussions).

	Milestone / Matter for Review	Strategy to mitigate
	Regulatory authorities may require the information requests to be lodged as official information requests.	This need should be recognised in the cover letter when issuing questionnaire packages.
	Regulatory authorities requirement payment of costs in supplying information	Charges may be reduced by addressing matters identified under Milestone 1. Such charges should be allowed for in the NWDS budget.
3	***Data Verification***	
	Permissions from landfills operators to carry out waste characterisation surveys and operational surveys	Polite personal contact with operators is needed. The purpose of survey and how results will be presented should be clearly explained. Operators should be assured of confidentiality. Offering to provide an operator with a copy of the site survey report (subject to The Ministry's approval) is an incentive. Ensure reserve sites are selected for site surveys.
	Conditions of approval for a site survey	Any conditions of undertaking a site survey should be sought from a landfill operator. If conditions are considered to be compromising, another site should be selected.
4	***Reporting***	
	Allow adequate time for preparing and lodging reports and other deliverables, and for review of reports and other deliverables.	Maintain good communication, ensure planned delivery dates are in NWDS programme and any changes are notified.

Appendix D Information about Ministry and MWH Databases

1. Overview

The T&T landfill database comprised five Microsoft Excel workbooks, four of which had a spreadsheet with landfill information for each local authority region. The landfills recorded in the database were non-levied landfills, and included operating and closed landfills for which resource consents had been issued by regional councils and permitted activity landfills.

T&T noted significant limitations to completing this work, including:

- in regions where certain types of non-municipal disposal (e.g. cleanfill) is a permitted activity, data was not captured (estimated there could be up to 2 to 3 times more unrecorded permitted cleanfill sites than consented cleanfill sites); and
- for known sites, actual tonnages were typically not recorded and in most cases were assumed based on consent limits.

T&T referred to levied landfills as 'municipal landfills'.

The landfill database provided by the Ministry to MWH comprised five Excel workbooks as follows.

Workbook 1 (File name: *Non-municipal Landfills LIST -T&T non-municipal landfill database - January 2014 (1551049))*

Main database with landfills recorded by region with between 22 and 28 columns of data per landfills (refer to *Column headings from spreadsheet for Auckland Region*)

Information on all known consented and permitted landfills:
- Site address and operator name and contact details
- GIS coordinates
- Consenting details
- Number of open/closed/unknown landfill sites
- Operational information (material accepted, volume, gate charges etc.)

Workbook 2 File name: *Non-municipal Landfills ANNUALDATA -T&T non-municipal landfill database - January 2014 (1551051)*

Data extracted from consents

Information on:
- Quality Rating (reliability of data in terms of "Data, Start Date and End Date" was ranked
- Open/Closed/unknown
- Composition of waste in terms of classification system using the report (see "composition legend' below)
- Area
- Tonnage
- Comments

Workbook 3 File name: *Non-municipal Landfills DATAFILLv2 -T&T non-municipal landfill database - January 2014 (1551052)*

Information on
- Gross Domestic Product (GDP) by region per year from 1950 to 2015
- Farms by region in terms of numbers, types, livestock or other metric and estimated waste

Workbook 4 File name: *Non-municipal Landfills COMPOSITION_CLASS -T&T non-municipal landfill database - January 2014 (1551054)*

Analysis of
- Landfills open and closed with time by region
- Landfill class

Workbook 5 (File name: *Non-municipal Landfills.Stats.v2 -T&T non-municipal landfill database - January 2014 (1551056))*

Summary statistics

Information by region and nationally on

- Composition of waste going to non-municipal (NM) landfills (open sites from 2000-2013)
- number of active NM landfills in the different classes of landfill (1-4)
- Tonnes of waste going to active NM landfills in the different classes of landfill (1-4)
- number of open and closed NM landfills
- Number of consented NM landfills.

Column headings from spreadsheet for Auckland Region

A. Region
B. pre2010 District
C. ID
D. Site Address
E. Disposal site name
F. Easting
G. Northing
H. Operator
I. Operators contact details: name, position, phone no
J. Consent Number
K. Consent granted
L. Consent expires
M. Consented amounts
N. Operating dates
O. Size
P. 2008 reported amounts
Q. 2010 reported amounts
R. Material accepted
S. Materials prohibited
T. 2007-08 compliance
U. 2009-10 compliance
V. Gate fee
W. Information Source
X. Comments
Y. Comments from Auckland Council, January 2011
Z. Consent/ permitted/ unknown
AA. Consent Type
BB. Purpose of consent

Composition Legend used in the T&T database

A	Asbestos
AH	Ash
B	Biological: Sludges from sewer/septic tanks and offal and meat based waste
C	Cleanfill
CD	Construction & Demolition
D	Domestic
F	Farm waste
GW	Green Waste
HZ	Hazardous
I	Industrial: Where specific type of industrial is unknown
IM	Industrial Mining: Mining tailings
IS	Industrial Steel: waste clay slimes from iron sand processing stormwater pond sludges minor general non-putrescible waste
MC	Managed Cleanfill
N	No info/not defined
S	Shells: Mussel/egg Stockpiles

SL	Inert Sludge: mud and cuttings from drilling, sludge from waste holding ponds, and sludge from the power station
U	Uncontrolled fill
W	Woodwaste

2. Database developed for purpose of MWH database update

Workbook 1 (File name: Non-municipal Landfills LIST -T&T non-municipal landfill database - January 2014 (1551049)) was adapted as the template for the updated database, called the Landfill Database. Column headers are:

LOCATION INFO.

A. Territorial Authority
B. ID
C. Site Name/ Address
D. Easting
E. Northing

FACILITY INFO.

F. Landfill Classification (Class 1, 2, 3 or 4)
G. Operator's name/ contact

CONSENTING INFO.

H. Consent Number
I. Consented quantity
J. Consented fill rate (m3/yr)
K. Materials permitted
L. Consent held (Y/N)

An explanation of what information should be provided in each column is provided in the landfill database.

Updating the landfill database was based predominantly on regional council responses. These response are recorded as follows. A duplication means a landfill entered in the database more than once (e.g. entries for each resource consent for a landfill). A temporary landfill is one for short term construction contract e.g. cleanfill for a road shaping contract.

- Northland Regional Council identified levied and closed landfills. No responses from TAs.
- Auckland Council provided a new list for operating, non-levied and consented landfills. It appears that this does not include the disposal sites for wastewater treatment plant sludge.
- Waikato Regional Council identified closed, duplications and temporary landfills. No responses from TAs
- Bay of Plenty Regional Council identified levied, closed and duplications and temporary landfills. Responses from Opotiki, Rotorua, and Whakatane District Councils and Tauranga City Counci.
- Taranaki Regional Council advised it required payment of costs to respond. The database update was based on a desktop assessment of information available in the T&T database and responses from the New Plymouth, South Taranaki and Stratford District Councils.
- Gisborne Regional Council did not respond to the questionnaire. The database update was based on a desktop assessment of information available in the T&T database..
- Hawkes Bay Regional Council identified levied, closed and duplications and temporary landfills. A response from Napier City Council.
- Horizons Regional Council did not respond. Horowhenua District Council identified levied, duplications and temporary landfills.
- Greater Wellington Regional Council identified levied, closed and duplications and temporary landfills. Responses from South Wairarapa District Council and Porirua City Council.
- Tasman District Council responded by advising there was no change to the database
- Nelson City Council identified levied, duplications and temporary landfills
- Marlborough Council identified levied, closed, duplications, and temporary landfills

- West Coast Regional Council identified levied, duplications and temporary landfills. Response from Westland District Council.
- Environment Canterbury an identified levied and a number of temporary landfills. No responses from TAs.
- Otago Regional Council identified permitted activity landfills. No responses from TAs.
- Environment Southland identified closed, duplications and temporary landfills. Response from Southland District Council.
- Chatham Islands Council confirmed that there were no known operating, non-levied & consented landfills.

3. Status Indicator of Landfill Database Information

	Council name	Contact information in database:		
		Landfill operator contact information	Classification of materials landfilled	Other information to complete database
1	Northland Regional Council			
2	Auckland Council[1]			
3	Waikato Regional Council			
4	Bay of Plenty Regional Council			
5	Gisborne District Council[2]			
6	Hawkes Bay Regional Council			
7	Horizons Regional Council[2]			
8	Greater Wellington Regional Council			
9	Tasman Council			
10	Nelson Council			
11	Marlborough Council			
12	West Coast Regional Council			
13	Environment Canterbury			
14	Otago Regional Council			
15	Environment Southland			
16	Chatham Islands Council			

Note
1. Required fee – did not proceed
2. Did not respond to survey

Code	Legend
	Sufficient information
	Some information available but incomplete
	No information available or little further information provided

Appendix E Landfill Database

See separate file

MfE Landfill Database_master list_v7.xlsx.

Appendix F Summary of Surveyed Sites

Summary of Surveyed Landfill Sites

Site ID	Region	Waste Composition- Consented[3]	Waste Composition- Observed[4]	Landfill Class[5] - Consented	Class Criteria[6]	Landfill Class[4] - Observed	Quantities- Consented[1]	Quantities- Observed[4]	Waste Recycled/ Reused at the site	Vehicles type[7]	Site Operator and Operational activities	Gate fees/ charges[8]
01	Wellington	1. C&D waste 2. Clay, soil, gravel, rock 3. Non putrescible waste 4. Organic materials <5% 5. Untreated & treated timber to be sorted and recycled	1. Site clearance and excavation materials 2. Reinforce concrete 3. Plastics 4. Untreated and treated timber 5. Liquid wastes	Class 2	C&D waste Organics >5%	Class 1	Filling allowed up to 240m above mean sea level. Quantity not stated in consent conditions.	676-962 m3/day	No	Type A Type B	Landfill operator/ account holder disposal site	Not made available to surveyor.
02	Bay of Plenty	1. Boiler ash from wood-fired boilers. 2. Waste material from recycling 3. Paper and cardboard waste. 4. Wood rejects and general mill waste	1. Boiler ash from wood-fired boilers. 2. Waste material from recycling 3. Paper and cardboard waste. 4. Wood rejects and general mill waste	Class 1	Organics >5%	Class 1	1,645,000 m^3 total till July 2031 (16 years)	50-120 tonnes/day (weighbridge record)	No	Type A	Pulp and paper mill/ private disposal site	N/a
03	Tasman	1. Gravel. Soil, clay, rock 2. Concrete rubble 3. Organic material <10%	1. Site clearance and excavation materials 2. Reinforce concrete 3. Spoil/clay/dirt 4. Some green waste 5. Timber (minor)	Class 3	C&D waste Organics >5%	Class 1	Not stated in consent conditions.	100-240 m3/day	No	Type A	Construction/ private disposal site	N/a
04	Marlborough	1. Cleanfill 2. C&D waste	1. Reinforced concrete (mostly small pieces) 2. Spoil/clay/dirt	Class 3	C&D waste Organics <2%	Class 3	Not available	110-129 m3/day	No	Type A	Construction/ private disposal site	N/a
05	Auckland	1. Cleanfill 2. C&D waste	1. Spoil/clay/dirt 2. Site clearance and excavation materials 3. Some reinforced concrete	Class 3	C&D waste Organics <2%	Class 3	Not available	416-688 tonnes/day (weighbridge record)	No	Type A Type B	Landfill operator/ account holder disposal site	Not made available to surveyor.
06	Horizons	1. Wood peelings 2. Sawdust	1. Wood peelings 2. Sawdust 3. Plastic wrappings (minor)	Class 1	Organics >5%	Class 1	235m3/week, or approx. 39m3/day	56-96 m3/day	No	Type A	Sawmill/ private disposal site	N/a
07	Western Bay of Plenty	1. Green waste 2. Cleanfill 3. Construction waste 4. Plastics and packaging	1. C&D wastes 2. Cleanfill 3. Greenwaste 4. Plastics, paper, glass, timber (minor)	Class 2	C&D waste Organics >5%	Class 1	Not stated in consent conditions.	258-357 m3/day	No	Type A Type B	Construction/ account holder disposal site	Not made available to surveyor.
08	Horizons	1. Green waste 2. Cleanfill 3. Construction waste	1. Site clearance and excavation materials 2. Reinforce concrete 3. Roading materials and asphalt 4. Untreated and treated timber	Class 2	C&D waste Organics 2-5%	Class 2	Not stated in consent conditions.	41-51 m3/day	No	Type A	Construction/ account holder disposal site	Not made available to surveyor.
09	Otago	1. Eggshells 2. Boiler ash 3. Poultry waste	1.Eggshells only	Class 1	Organics >5%	Class 1	Not available	1.5 m3/day	No	Type B	Poultry farm/ private disposal site	N/a
10	Canterbury	1. Cleanfill 2. Roading material 3. Soil	1. Roading materials and asphalt 2. Soil	Class 2	C&D waste Organics <2%	Class 2	Not available	366-502 m3/day	No	Type A	Construction/ account holder disposal site	$2/tonne (unconfirmed)
11	Taranaki	1. Greenwaste (grass clippings, hedge trimmings, sticks/ branches/ logs <100mm dia.)	1. Greenwaste 2. Soil/clay/dirt 3. C&D waste (minor) 4. Refuse (minor)	Class 1	Organics >5%	Class 1	Not stated in consent conditions.	27-31 m3/day	No	Type B Type C	Greenwaste/ public disposal site	Free

[3] Information provided by Regional/Territorial Councils/ T&T database or Resource Consent document of respective landfill site. “Not available” means the information was not provided or copy of consent was not available.
[4] Based on landfill site survey using the Solid Waste Analysis Protocol – Visual Classification Methodology, Ministry for the Environment, March 2002.
[5] Desktop assessment of based on the consented waste composition and landfill classification given in the Technical Guidelines for Disposal to Land, Waste Management Institute New Zealand, April 2016, pp 96-102.
[6] Site survey records were analysed against the Class limiting criteria given by WasteMINZ 2016. Limits are in % by volume per load. A > symbol means criterion was exceeded.
[7] Type A: Large vehicles – trucks and trailers. Typically bring bulk waste from commercial generators.
Type B: Small trucks and trailers. Typically bring waste from smaller commercial operations e.g. builders.
Type C: Cars and small trailers. Typically bring domestic quantities.
[8] N/a means not applicable (ie a private site used for waste generated by the private company)

Site ID	Region	Waste Composition- Consented[3]	Waste Composition- Observed[4]	Landfill Class[5] - Consented	Class Criteria[6]	Landfill Class[4] - Observed	Quantities- Consented[1]	Quantities- Observed[4]	Waste Recycled/ Reused at the site	Vehicles type[7]	Site Operator and Operational activities	Gate fees/ charges[8]
12	Bay of Plenty	1. Log yard wood residue 2. Soil and gravel contaminated bark, wood fibre/chip, sawdust and small wood off cuts	1. Tree stems, bark, peelings 2. Dirt, mixed metals	Class 1	Organics >5%	Class 1	25,000 m3 per annum or approx. 80 m3/day	80-100 m3/day	No	Type A	Timber processing/ private disposal site	N/a
13	Taranaki	1. Cleanfill 2. Inert materials	1. Spoil/clay/dirt 2. Mixed metals 3. Concrete rubble 4. Organic matter (minor)	Class 4	Inert manufactured materials >5% Organics <2%	Class 3	Not available	72-161 m3/day	No	Type A	Construction/ private site	N/a

Appendix G Site Survey Analysis

See separate file

Appendix H Site Survey Reports

See separate file

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