Moving from Minimum Requirements to the Waste Regulations – challenges and issues within the waste management field

Schoonraad, JL, EnviroServ (Pty) Ltd, South Africa. johans@enviroserv.co.za

ABSTRACT
Waste management legislation in South Africa has undergone dramatic change in the past three years with the phasing out of the Minimum Requirements, a guideline system developed by the now defunct Department of Water Affairs and Forestry (DWAF), and the introduction of a mandated waste management regime as contained in the Waste Regulations. The impact on both the waste management industry and waste generators in the sense of legal liability, cost and complexity in decision making has been significant and has required extensive changes in the thought processes related to the proper management of waste in South Africa, particularly when viewed against the historic use of landfill disposal as the most prevalent waste management solution used.

1. INTRODUCTION

1.1 Development of Environmental Legislation in South Africa

Legislation directly linked to waste management in South Africa can be traced back to the Water Act of 1956.This document empowered the Minister of Water Affairs and Forestry under "**Regulations relating to the prevention of the pollution of water**" to make regulations relating to "*the registration with the department and use of sites or portions of sites or any land where water used for industrial purposes or effluent or any waste is disposed of or will be disposed of with the purpose of discarding it and the control over and the disposal of such sites or portions of such sites or such land*". It is clear from this document that the Department of Water Affairs and Forestry (DWAF) viewed protection of the aquatic environment and water resources as their primary objective and that it is this thinking that guided their decisions with respect to the design and management of landfill sites in the preceding years.

The promulgation of the Environment Conservation Act (ECA) in 1989 further advanced waste legislation in South Africa by firstly defining what would be viewed legislatively as "waste" as well as introducing the concept of the licensing of waste disposal sites. In addition, the ECA empowered the Minister to make regulations regarding "*the classification of different types of waste and the handling, storage, transport and disposal of such waste*". This led to the ***Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste*** *which* was first published in 1994, followed by a revised Second Edition in 1998. It is the later which will be evaluated against more recent legislation dealing with waste management in South Africa.

In a sense, the **South African Constitution** (1996) changed the framework of environmental management in South Africa with the bold stance that "*Everyone has the right to an environment that is not harmful to their health or well-being*"; that the environment is to be "*protected, for the benefit of present and future generations*"; and that "*sustainable development*" will be promoted. The establishment of the Department or Environmental Affairs and Tourism (DEAT) as the legislative authority in all matters related to waste and the environment (circa 2005) was followed by the rapid development of waste legislation that placed more focus on waste management according to the well-known waste hierarchy with the intention of moving away from landfill disposal as the primary solution for waste management. In this context then, the promulgation of the **National Environmental Management Act** (NEMA) in 1998 and the **National Environmental Management: Waste Act** (NEMWA) in 2008 clearly demonstrated that waste management according to the well-known waste hierarchy were the future in South Africa as they promoted the Department's stance that "*waste is (to be) avoided, or where it cannot be altogether avoided, minimised and reused or recycled where possible and otherwise disposed of in a responsible manner*". The publication of succeeding and empowering regulations such as the **Waste Management Regulations** and their associated **Norms and Standards** in 2013 have been a revelation to many in the waste generation and management fields. These are no longer simply guideline documents as the **Minimum Requirements** were, in contrast, mandated compliance is now required from generators, transporters and managers of both general and hazardous waste with the focus being on waste management in order to promote sustainable development.

1.2 Comparison of the Minimum Requirements with the Waste Regulations

Some of the major differences between the Minimum Requirements and the recently promulgated Waste Regulations are reflected in Figure 1 below.

Minimum Requirements	Waste Regulations
From 1998 - 2013	Promulgated 23 August 2013
Landfill focussed	Waste hierarchy focussed
Hazardous & general waste landfill sites	4 classes of landfill, Class A – D; not linked to hazard rating
Hazard class using SANS 10228	Hazard rating using SANS 10234
Conservative leach limits used	Total and leach concentrations used
Landfill load limits applicable	No landfill load limits
Limited documentation required	Hazardous waste requires a manifest and a Safety Data Sheet (SDS) to accompany the waste

Figure 1: Comparison of Minimum Requirements (1998) and Waste Regulations (2013)

One of the major concepts introduced by the Minimum Requirements and an apparent glaring omission in the Waste Regulations was the stance that "*Hazardous Waste requires stringent control and management, to prevent harm or damage and hence liabilities. It may only be disposed of on a Hazardous Waste landfill*". The impact of this change and its potential impact on the health of SA citizens as well as the potential for environmental contamination will be elucidated in the following sections.

2. DECISION MAKING TOOLS

The range of decisions required for proper waste management are not vast, however, the impact of an incorrect decision can have significant, possibly fatal, consequences for humans as well as a range of impacts on the natural environment and could, at the very least, incur significant financial penalties in the form of fines and/or incarceration if incorrectly done. This document will delve into some of the decision tools that are legally required to properly manage waste and how the legislated changes in these tools have often brought about uncertainty in the waste management field and consequently resulted in poor waste management by the ill-informed and occasionally unscrupulous waste generator and/or waste manager.

2.1 Definition of waste

It is apparent that one of the first decisions that would influence the proper management of a waste material is the one that would move it into the waste management legislation domain or leave its control under other relevant legislation such as the **Occupational Health and Safety Act** (1993) or the **Consumer Protection Act** (2008). It is therefore relevant to briefly review the changes in the legislative definition of waste from circa 1990 to the present.

According to the Minimum Requirements, "***waste***" is defined according to the Government Gazette of 24 August 1990 as:

> "*an undesirable or superfluous by-product, emission, residue or remainder of any process or activity, any matter, gaseous, liquid or solid or any combination thereof, which:-*
> *(a) is discarded by any person; or*
> *(b) is accumulated and stored by any person with the purpose of eventually discarding it with or without prior treatment connected with the discarding thereof; or*
> *(c) is stored by any person with the purpose of recycling, re-using or extracting a usable product from such matter*"

This definition has several exclusions from the definition, predominantly industrial effluents and sewerage governed by the Water Act, radioactive materials governed by the Nuclear Energy Act (1982) or assorted mining wastes covered by the Mines and Works Act (1956).

It is clear from this definition that even material intended for reuse, recycling and recovery was viewed as a waste and hence subject to waste legislation.

In contrast, the NEM:WA (2008) has an alternative definition of "waste" which is as follows:

> *"waste" means any substance, whether or not that substance can be reduced, re-used, recycled and recovered—*
> *(a) that is surplus, unwanted, rejected, discarded, abandoned or disposed of;*
> *(b) which the generator has no further use of for the purposes of production;*
> *(c) that must be treated or disposed of; or*
> *(d) that is identified as a waste by the Minister by notice in the Gazette, and includes waste generated by the mining, medical or other sector, but—*
> *(i) a by-product is not considered waste; and*
> *(ii) any portion of waste, once re-used, recycled and recovered, ceases to be waste;*

While the two definitions appear similar in considering a material that is surplus a waste regardless of whether or not the material could be recycled, recovered or reused, the Waste Act also introduced the concept of a waste material being viewed as a "by-product" and hence moving a material defined as such outside waste legislation. This would in theory allow for indeterminate lengths of storage as a "by-product" and not put pressure on the generator to review or follow waste management protocols in order to reduce or minimize potential human health or environmental impacts. In addition, the NEM:WA definition of waste [bullet (d)(ii)] only removed waste from the definition of waste and the associated legislation once all three (3) higher order waste management options, namely re-use, recycling and recovery, had been implemented. By legislative definition, a "waste" would remain a "waste" unless it had been recovered, re-used and recycled.

The impact of this clause was significant, particularly as "re-use" had also been defined in the NEM:WA (2008) as follows:

> **"***re-use" means to utilise articles from the waste stream again for a similar or different purpose without changing the form or properties of the articles*

Various industries using waste as an alternative raw material (eg. various metal slags and ash in the form of boiler or fly ash in the cement industry) could demonstrate that recycling and recovery as defined in the NEM:WA had occurred but could not show compliance with the definition of "re-use" as the wastes used in their process could not be used "*without changing the form or properties of the articles".* This would imply that the product produced would in theory be contaminated with a waste making the product a waste.

Vigorous engagement between various industries and the legislators ensued. Despite this, the matter was only resolved after five (5) years with the promulgation of the **National Environmental Management: Waste Amendment Act (2014)**. This removed the definition of "by-product" simplifying on the one hand the management of surplus materials as these would henceforth be viewed as "waste", however, it added a revised definition of "waste" including a substantial list of materials pre-defined by the Minister (responsible for environmental affairs) as either hazardous waste, non-hazardous waste, or in some cases both. This is shown below for comparative purposes and is worth evaluating against the definition originally provided by the Minimum Requirements as well as that previously given in the NEM:WA. According to the Waste Amendment Act (2014):

> "**"***waste' means—*
> *(a) any substance, material or object, that is unwanted, rejected, abandoned, discarded or disposed of, or that is intended or required to be discarded or disposed of, by the holder of that substance, material or object, whether or not such substance, material or object can be re-used, recycled or recovered and includes all wastes as defined in Schedule 3 to this Act; or*
> *(b) any other substance, material or object that is not included in Schedule 3 that may be defined as a waste by the Minister by notice in the Gazette, but any waste or portion of waste, referred to in paragraphs (a) and (b), ceases to be a waste—*
> *(i) once an application for its re-use, recycling or recovery has been approved or, after such approval, once it is, or has been re-used, recycled or recovered;*
> *(ii) where approval is not required, once a waste is, or has been re-used, recycled or recovered;*

> *(iii) where the Minister has, in terms of section 74, exempted any waste or a portion of waste generated by a particular process from the definition of waste; or*
> *(iv) where the Minister has, in the prescribed manner, excluded any waste stream or a portion of a waste stream from the definition of waste.*

The significance of pre-definition of waste as hazardous according to the Schedule 3 mentioned above and its subsequent impact on the landfill disposal of such hazardous waste will be discussed in Section 2.2 below.

2.2 Definition of hazardous waste

It is clearly important that once a decision has been made as to whether a material is a waste or not a second decision is required as to whether the waste is hazardous or non-hazardous. This second decision would guide the final destination of the waste under the Minimum Requirements which supported the philosophy that hazardous waste "*may only be disposed of on a Hazardous Waste landfill*".

According to the Minimum Requirements, a hazardous waste was defined as:

> "*an inorganic or organic element or compound that, because of its toxicological, physical, chemical or persistency properties*, may exercise detrimental acute or chronic impacts on human health and the environment. It can be generated from a wide range of commercial, industrial, agricultural and domestic activities and may take the form of liquid, sludge or solid. These characteristics contribute not only to degree of hazard, but are also of great importance in the ultimate choice of a safe and environmentally acceptable method of disposal*."

In contrast, the NEM:WA (2008) simplified this and also made use of the Precautionary Principle by including the use of the word "*may*" in its definition which is as follows:

> ''*hazardous waste'' means any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environment*;

Inherently this definition would then appear to assume that a waste is viewed as hazardous until proven otherwise. The test methods promoted by the two systems for determining hazard, Minimum Requirements versus the Waste Regulations, are however vastly different and have a significant influence on the management of waste using landfill disposal as a waste management solution. In this context then waste classification under the Minimum Requirements always had as endpoint the determination of a Hazard Rating for a waste which would then guide the waste manager in the direction of the most suitable hazard waste landfill class ie. a landfill with suitable engineering to deal with the identified hazard(s). In contrast, the Waste Regulations published under the auspices of the NEM:WA take a different route with classification. Under the Waste Regulations, classification implies determination of whether a waste is hazardous or not but has limited to no impact on the class of landfill chosen for final disposal of the waste. Some of the major differences on hazard identification between the Minimum Requirements and the recently promulgated Waste Regulations are reflected in Figure 2 below.

Minimum Requirements	Waste Regulations
Identifies industries and processes, which are likely to generate Hazardous Waste	Schedule 3 of Waste Amendment Act (2014) pre-defines many wastes as hazardous
Testing and analysis to determine the hazardous properties, characteristics and components of a waste to confirm whether the waste is Hazardous or not.	Hazard properties of waste determined using SANS 10234 [Globally Harmonized System of classification and labelling of chemicals (GHS)]
Classification and treatment in accordance with SABS Code 10228 "The Identification and Classification of Dangerous Substances and Goods"	SANS 10234 cannot be used to re-classify waste pre-defined as hazardous.
Analysis and Hazard Rating of the waste or its residue using USA TCLP method, in order to determine the Hazard Rating and the Minimum Requirements for landfill disposal.	Disposal of hazardous waste not limited to hazardous waste landfills

Figure 2: Hazard Determination: Minimum Requirements (1998) versus Waste Regulations (2013)

It is relevant to note that that the Minimum Requirements makes a clear distinction between a danger rating for transport (ie. the risk the substance poses to man during transport) and the Hazard Rating for Disposal (ie. the risk to the environment). The former makes use of information typically related to physical hazards as required by SANS 10228 (eg. flammability, explosive; corrosive) as well as LD_{50} data (mammalian toxicity) while the later makes more use of LD_{50}[3] as well as LC_{50}[4] (aquatic toxicity) data. The Waste Regulations make no such distinction and rely on other legislation to govern transport of dangerous goods.

The Waste Regulations make use of SANS 10234 (the South African version of the GHS system) to make the call on the hazardous nature of a waste. This is inherently a complex system arguably designed for rating the hazard nature of products which are normally either single component systems or have a limited number of constituents. Waste by its very nature is seldom this simple and most analyses will identify dozens to hundreds of pollutants in a waste, each of which then require evaluation under the GHS system (SANS 10234) before a decision is made as to the hazard nature of the waste. The time and cost involved in such a process is substantial. Complicating such hazard evaluation is the list of pre-defined wastes in Schedule 3 of the Waste Amendment Act (2014). It has been clearly stated by the DEA that once a waste has been pre-defined under Schedule 3 as hazardous this classification cannot be changed by evaluation using SANS 10234 without submitting an appeal to the Minister.

In this context it should be noted that due to the wording of Schedule 3 which refers to "*waste from the manufacture, formulation, supply and use (MFSU) of*" inorganic chemicals as well as "*waste from the manufacture, formulation, supply and use (MFSU) of basic organic chemicals*" as being pre-defined as hazardous, this would imply that all wastes generated where a chemical was used would be viewed as hazardous. This is presumably not the intent of Schedule 3 but clearly demonstrates the challenge in defining in law what is to be viewed as a hazardous waste rather than defining the tool to be used to make the decision. This pre-definition then nullifies the use of SANS 10234 as according to the DEA as stated earlier the pre-definition can only be changed upon appeal to the Minister.

2.3 Assessment for suitability of landfill

The assessment of waste for landfill disposal appears to follow two distinctly different philosophies when comparing the Minimum Requirements with the Waste Regulations. The very conservative approach adopted by the Minimum Requirements appears to make the assumption that liquids (leachate) generated in the landfill environment will at some point escape into the open environment. This is encapsulated in the calculation of the Estimated Environmental Concentration (EEC) for every risk element or compound in a

[3] Lethal Dose, 50%" or median lethal dose. It is the amount of the substance required (usually per body weight) to kill 50% of the test population
[4] "Lethal concentration" is the concentration of the chemical in the air or water that will kill 50% of the test animals with a single exposure.

waste and its use in determining the actual load of a waste that may be disposed to a designated landfill site as well as the final load capacity of the landfill site.

In contrast, the Waste Regulations place no limit on how much of a specific pollutant may be disposed to a landfill site as long as the total and leach concentrations of the contaminant meet the specified Norms and Standards linked to the engineering of the site.

It is also notable that whereas the conservative approach of the Minimum Requirements required the loading calculation to be done for every contaminant in a waste stream, the Waste Regulations have a substantially abbreviated list of risk elements and compounds requiring evaluation and it is only when a waste is declared hazardous that a level of conservatism is used in landfill assessment. This conservatism then demands that a hazardous waste having elements and/or organic compounds not listed in the Norms and Standards be viewed as a very high risk waste with disposal then being mandated to the highest level of engineered landfill site. The consequences of this approach will be detailed in section 2.4 below.

2.4 Landfill types

As reflected in the table shown in Figure 1, the Minimum Requirements had two broad categories of landfill design, namely general waste disposal sites (typically classed as G-class sites) and hazardous waste disposal sites (typically classed as H-class sites). It is also notable that even should a hazardous waste have been treated to make it suitable for disposal to a G-class (general waste) landfill and permission have been obtained from the Department for disposal to such a site (a process described as “delisting”), the waste was not viewed as “general waste” but was simply viewed as a lower risk, hazardous waste. This is clearly reflected in the excerpt from the Minimum Requirements shown in Figure 3.

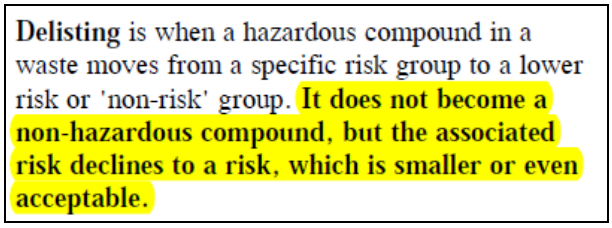

Delisting is when a hazardous compound in a waste moves from a specific risk group to a lower risk or 'non-risk' group. **It does not become a non-hazardous compound, but the associated risk declines to a risk, which is smaller or even acceptable.**

Figure 3: Hazard rating of “delisted” hazardous waste according to Minimum Requirements (1998)

Such a precautionary approach would flag that disposal to general waste landfill sites should be approached with caution, particularly where access control to such sites is poor and the general population moving over such sites could be exposed to potentially hazardous materials.

The Waste Regulations, however, make no such delineation and landfill disposal is primarily linked to the concentration of risk elements or compounds and ensuring that the risk of escape to the aquatic environment is mitigated and controlled via the landfill engineering chosen. This consequently then legally allows the disposal of hazardous waste to landfill environments that could have no access control systems in place (eg. fencing, single entry gate, guardhouse, etc) but have the required landfill lining systems to manage the waste. The risk of poor disposal and the consequent exposure of individuals to various hazardous elements is exacerbated when dealing with dust materials containing heavy metals or other contaminants that would be viewed as hazardous but are at concentration that the waste is deemed suitable for disposal to a municipal waste disposal site with a low level of engineering.

3. SELECTED CASE STUDY

In an attempt to illustrate more fully some of the significant differences between the two waste management systems under review, a case study of an actual waste stream is presented here without identifying the company generating this waste stream.

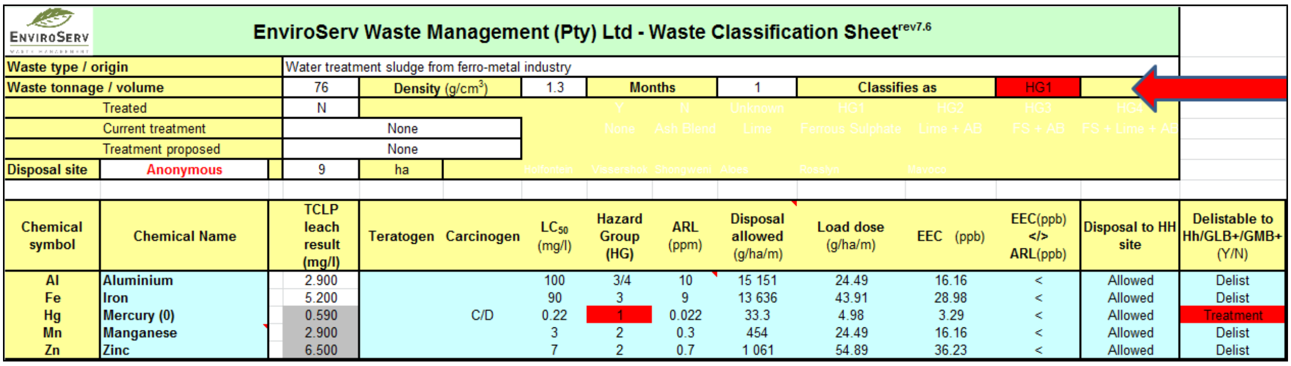
3.1 Water treatment sludge from ferro-metal industry

During the manufacture of various ferro-metal products, a significant amount of waste water sludge is generated. The stream under discussion amounts to ~920t/a or ~76t/m. For purposes of discussion the most significant inorganic risk elements found in this waste stream will be compared when evaluated under Minimum Requirements as well as the Waste Regulations.

3.1.1 Minimum Requirements

Due to the origin of the waste (the ferro-metal industry), the waste would be flagged as potentially hazardous.

Tests for total concentrations of contaminants were seldom if ever conducted under this test regime and hence it was often difficult or impossible to estimate the hazard rating (toxicity) of a waste under SANS 10228 according to human exposure criteria. However, as landfill disposal required information on the leachable nature of the risk elements in a waste stream (based on the US EPA derived TCLP[5] testing methodology), there would typically be leach information available for a waste stream which would allow the waste to be evaluated for aquatic toxicity. The relevant TCLP data for this waste stream is reflected in Figure 4 below:



EnviroServ Waste Management (Pty) Ltd - Waste Classification Sheet rev7.6

Waste type / origin	Water treatment sludge from ferro-metal industry						
Waste tonnage / volume	76	Density (g/cm^3)	1.3	Months	1	Classifies as	HG1
Treated	N						
Current treatment	None						
Treatment proposed	None						
Disposal site	Anonymous	9	ha				

Chemical symbol	Chemical Name	TCLP leach result (mg/l)	Teratogen	Carcinogen	LC$_{50}$ (mg/l)	Hazard Group (HG)	ARL (ppm)	Disposal allowed (g/ha/m)	Load dose (g/ha/m)	EEC (ppb)	EEC(ppb) </> ARL(ppb)	Disposal to HH site	Delistable to Hh/GLB+/GMB+ (Y/N)
Al	Aluminium	2.900			100	3/4	10	15 151	24.49	16.16	<	Allowed	Delist
Fe	Iron	5.200			90	3	9	13 636	43.91	28.98	<	Allowed	Delist
Hg	Mercury (0)	0.590		C/D	0.22	1	0.022	33.3	4.98	3.29	<	Allowed	Treatment
Mn	Manganese	2.900			3	2	0.3	454	24.49	16.16	<	Allowed	Delist
Zn	Zinc	6.500			7	2	0.7	1 061	54.89	36.23	<	Allowed	Delist

Figure 4: Leach data for a water treatment sludge from the ferro-metal industry
(Only significant inorganic risk elements detected under TCLP methodology shown)

Of significance is the presence of leachable mercury (Hg) in this waste stream. As the Acceptable Risk Level (ARL) for leachable mercury (Hg) when calculated in ppb exceeds the Estimated Environmental Concentration (EEC) value (also in ppb), the waste would be rated as an extreme hazard waste (HR1) under the procedures describes in the Minimum Requirements. This would imply that the waste is hazardous and disposal to a hazardous landfill with a design suitable to receive extreme hazard waste is mandated. This would be a class H:H site in Minimum Requirements parlance. The table in Figure 4 also reveals that the waste could be potentially treated (red highlight) for disposal to a general waste landfill site (a G+ landfill ie. a lined landfill site with leachate capture system). However, as highlighted earlier, the waste would still be viewed as a hazardous waste even if treatment dropped the hazard rating from the current HR1 rating to a HR3 (moderate hazard) or HR4 (low hazard) waste. This is particularly relevant when comparing to evaluation under the Waste Regulations.

3.1.2 Waste Regulations

Evaluation of the identical waste under the Waste Regulations requires comparison of the total concentrations of the relevant risk elements in the waste against the cut-off thresholds published in SANS 10234 (see Figure 5).

Of significance when comparing these published threshold values to the concentrations of the relevant risk elements for the waste stream as reflected in Table 6 is that only iron (Fe) exceeds the 1% (10 000ppm) threshold while none of the others exceed the 0.1% (or 1000ppm) threshold required to flag the waste as hazardous, despite the waste stream containing mercury (Hg). It should be noted that the Waste Regulations do not require evaluation of iron (Fe) concentration in a waste stream prior to landfill disposal. While it should be self evident that the form of the iron (Fe) in the waste could potentially impact the hazard rating under SANS 10234, for the purposes of this discussion it is not assumed to make the waste hazardous and the waste stream is hence seen as non-hazardous for further discussion in this publication.

Assessment of the waste against the landfill norms and standards published under the Waste Regulations requires use of total (Figure 6) as well as leach data (Table 7) and reveals that this waste stream, despite containing a significant level of mercury (Hg = 130 mg/kg) would be rated as a moderate risk waste and can be disposed to any municipal landfill rated as a Class B facility (equivalent to a G:L:B+ landfill under the Minimum Requirements). The presence of the mercury (Hg) would not have to be flagged as requiring

[5] Toxicity characteristic leaching procedure

special management to reduce risk to the human population moving on or around the landfill site and disposal to a hazardous waste management facility is not mandated.

1	2
Hazard class	**Cut-off value (concentration limit)** **%**
Acute toxicity	≥ 1,0
Skin corrosion	≥ 1,0
Skin irritation	≥ 1,0
Serious damage to eyes	≥ 1,0
Eye irritation	≥ 1,0
Respiratory sensitisation	≥ 1,0
Skin sensitisation	≥ 1,0
Mutagenicity: Category 1 Category 2	 ≥ 0,1 ≥ 1,0
Carcinogenicity	≥ 0,1
Reproductive toxicity	≥ 0,1
Target organ systemic toxicity Single exposure Repeat exposure	 ≥ 1,0 ≥ 1,0
Hazardous to the aquatic environment	≥ 1,0

Figure 5: Cut-off values/concentration limits for hazard classes

What is also not clear at this point would be the pre-definition under Schedule 3 as outlined in Section 2.2 above. From the wording in Schedule 3 which refers to "*waste from the manufacture, formulation, supply and use (MFSU) of*" both inorganic as well as basic organic chemicals, it would appear as if this waste stream should be classified as hazardous. This appears not to have been done by the generator of the waste stream nor the waste managers dealing with this waste and is a demonstration of the difficulty in applying the strict letter of the law in relation to Schedule 3.

EnviroServ Waste Management (Pty) Ltd - Landfill Waste Assessment - TOTALS

Waste type / origin	④	Water treatment sludge from ferro-metal industry					
Waste tonnage / volume	⑤	51	**Density** (g/cm³)	1.30	**Classifies as Type**	2	Moderate Risk Waste
Treated		N					
Current treatment		None					
Treatment proposed		None					
Disposal site ⑥	Anonymous	6	**Ha**				

Chemical symbol	Chemical Name	Total Concentrations (mg/kg)	NOTE	Waste Classification for Landfill Disposal	Disposal to
Al	Aluminium	8 013.000		No regulated limit	
Fe	Iron	105 033.000		No regulated limit	
Hg	Mercury (0)	130.000		Type2-Moderate Risk Waste	Class B Landfill
Zn	Zinc	1 616.000		Type2-Moderate Risk Waste	Class B Landfill

Figure 6: Total concentration data for a water treatment sludge from the ferro-metal industry (Only significant inorganic risk elements detected shown)

EnviroServ Waste Management (Pty) Ltd - Landfill Waste Assessment - Leachables (ASLP)

Waste type / origin		Water treatment sludge from ferro-metal industry					
Waste tonnage / volume		51	Density (g/cm^3)	1.30	Classifies as Type	2	Moderate Risk Waste
Treated		N					
Current treatment		None					
Treatment proposed		None					
Disposal site	Anonymous	6	Ha				

Chemical symbol	Chemical Name	Acetic acid pH = 2.9	⑦ Choose leach solution	Waste Classification for Landfill Disposal	Disposal to
Al	Aluminium	2.900		No regulated limit	
Fe	Iron	5.200		No regulated limit	
Hg	Mercury (0)	0.590		Type2-Moderate Risk Waste	Class B Landfill
Zn	Zinc	6.500		Type3-Low Risk Waste	Class C Landfill

Figure 7: Leach concentration data for a water treatment sludge from the ferro-metal industry (Only significant inorganic risk elements detected under ASLP test methodology shown)

4. DISCUSSION AND COMPARATIVE EVALUATION

The Waste Regulations as published also incorporate various prohibitions on selected waste streams in an apparent attempt to mitigate and manage the impact these waste streams in the landfill environment. Of relevance to this discussion document is an impending ban on the disposal of fluorescent tubes (as hazardous mercury containing waste) to landfill disposal sites. A cursory review of Safety Data Sheets available from various suppliers of such fluorescent tubes revealed them to contain <0.01% (or <100ppm) by weight of mercury (Hg), far below the 0.1% (1000ppm) threshold required to flag them as hazardous waste under SANS 10234.

In contrast to the above mandated waste management strategy for fluorescent tubes, the Waste Regulations do not flag the water treatment sludge (from the ferro-metal industry) under discussion as hazardous waste when applying SANS 10234, despite this waste stream containing significant and similar levels of the same pollutant (namely mercury). Whereas disposal of fluorescent tubes will be prohibited in the very near future by the Waste Regulations, there are significant volumes of other waste streams such as the water treatment sludge under discussion that are permitted to be disposed of as non-hazardous waste at municipal landfill sites which in many cases have limited or non-existent access control to these facilities. Of significant concern is that this waste stream, being but one of many, would previously have been flagged as hazardous under the now defunct Minimum Requirements system and its more conservative approach to hazard rating. The risk of exposure to significant pollutants in wastes disposed as non-hazardous (or general) wastes to what were historically known as non-hazardous (or general) waste disposal sites needs to be carefully reassessed, particularly when considering dust and gaseous emissions from wastes that can potentially be labelled as non-hazardous under the Waste Regulations.

It is relevant that even in low concentrations many pollutants would be considered as hazardous to human health depending on the exposure pathway, in particular via inhalation, and that these can have a significant impact on human health and well-being. In this sense then the Waste Regulations appear to be very liberal in their defining of waste as non-hazardous when they are known to contain low levels of significant contaminants and the more conservative approach adopted by the Minimum Requirements appears to be better. The latter almost automatically assumes under the Precautionary Principle that industrial wastes are hazardous until proven otherwise and in addition, uses very sensitive and sensible aquatic toxicity data to either confirm the hazard or demonstrate that the contaminant is a low level risk. This conservative approach is then further promoted in that hazardous waste required disposal to a hazardous waste landfill site, even should the waste only present a low risk. The incorporation of a similar risk based approach is recommended and should be introduced as an improvement to the Waste Regulations.

5. CONCLUSION

The shift from the Minimum Requirements to the Waste Regulations as the regulatory framework for waste management has brought about much confusion in the waste management industry.

The formulation of a simple definition for what is to be viewed as "*waste*" would be a start to better waste management in South Africa. This should be linked to a well-defined tool to decide on the hazardous nature or not of a waste which would then assist with the better management of "*hazardous waste*". This combined with a risk based approach rather than the application of a limited set of Norms and Standards as well as the re-introduction of the concept of disposal of hazardous waste only to hazardous waste landfill sites would go a long way in untangling some of the confusion currently experienced by waste generators, waste transporters and waste managers in South Africa.

6. REFERENCES

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