PUBLIC ACCESS

REPORT

Compiled for

WASTE GIANT LANDFILL (PTY) LTD

on behalf of

ENVITECH SOLUTIONS (PTY) LTD

FINAL SCOPING REPORT FOR THE VLAKFONTEIN WASTE TREATMENT FACILITY

Report No WGSCOREP/2010/02

7 December 2010

PO Box 1525, North Riding, 2162
South Africa
Cell: 082 554 8900
Tel: 011 462 2985 Fax: 086 657 1612
E-mail: francois@softchem.co.za
Website: www.softchem.co.za

- **water and waste management**
- **environmental management**
- **environmental assessments**
- **air pollution assessments**
- **dedicated software**

FINAL SCOPING REPORT FOR THE VLAKFONTEIN WASTE TREATMENT FACILITY

Compiled by: .....
JFC Friend
PrEng CEng

Contributors
S Jewaskiewitz
E de Jager

Date: 7 December 2010

File No: WGSCOREP2010.02.DOC

Report No: WGSCOREP/2010/02

Order No: EVT 3/061

EXECUTIVE SUMMARY

This scoping report was compiled as a requirement to Regulation 718 of 3 July 2009 that lists waste management activities in terms of the National Environmental Management: Waste Act (No 59 of 2008), read in conjunction with Regulation 543 of 18 June 2010 that stipulates the environmental impact assessment regulations in terms of Sections 24(5), 24M and 44 of the National Environmental Management Act (No 107 of 1998).

TABLE OF CONTENTS

TABLE OF CONTENTS

1. INTRODUCTION

Envitech Solutions (Pty) Ltd was appointed by Waste Giant Landfill (Pty) Ltd to assist with the site selection process, site investigations and technical design for a new integrated waste treatment and disposal facility in order to facilitate the application for a waste license in terms of the National Environmental Management: Waste Act (No 59 of 2008). They subsequently requested Softchem to complete the environmental impact assessment process required by Regulation 718 of 3 July 2009 that lists waste management activities in terms of the National Environmental Management: Waste Act (No 59 of 2008), read in conjunction with Regulation 543 of 18 June 2010 that stipulates the environmental impact assessment regulations in terms of Sections 24(5), 24M and 44 of the National Environmental Management Act (No 107 of 1998). This report represents the scoping report required in terms of Section 28 of the EIA regulations to accompany the waste licence application.

2. DESCRIPTION OF THE PROPOSED ACTIVITY

Waste Giant Landfill (Pty) Ltd is an established waste management company with operations including both the collection and disposal of general and hazardous wastes. The company is considered to be the fourth largest waste management company in South Africa and has been in existence since 1994.

In terms of the development and growth of the Waste Giant group, the need was identified for a comprehensive, integrated waste treatment and disposal facility, which would meet the requirements of the National Environmental Management: Waste Act (No 59 of 2008) and the new National Waste Management Strategy (NWMS) that has been developed in accordance with the Waste Act. Adherence to the waste management hierarchy as described in the MWMS is of particular importance in this project.

A site selection process was carried out in accordance with the Minimum Requirements for Waste Disposal by Landfill (DWAF, 1998). Various sites were identified and evaluated to determine their suitability for the intended use as described above. After due consideration of all the relevant criteria, it was decided that the existing De Deur Brickworks site (now disused) met with the required criteria in terms of the technical aspects of site selection. The existing De Deur Brickworks site (Vlakfontein) is considered to be a “brown fields” site due to the substantial disturbance of the land arising from significantly deep excavations for clay materials, stockpiling of brick wastes and derelict brick kilns and buildings that were used during the brick making operations.

The proposed development will therefore enable the rehabilitation of the existing site through properly engineered landfill, closure and rehabilitation procedures, which form part of the proposed development. In accordance with the proposed new National Waste Management Strategy, the proposed waste treatment and disposal facility will include the following:

- materials recovery facility (MRF) for the recovery of recyclables,
- hazardous wastes (extreme and high risk wastes); and
- an engineered landfill (classification “B”) developed in a series of cells.

The proposed facility is intended to accept the following waste streams for treatment and disposal:

- general wastes comprising domestic, commercial and industrial wastes;
- health care risk wastes HCRW treatment facilities (for both infectious and pathological wastes), and
- health care risk wastes.

A general site layout plan of the proposed activity is presented in Appendix A. It is envisaged that the proposed development will consist of the following facilities and infrastructure:

Entrance area with access control – security gate with boom control to control all vehicles entering the facility.

Weighbridges – to record all incoming and outgoing vehicles and their loads.

Administration building with parking – sufficient on-site parking will be provided for all site staff and visitors to the facility.

Waste acceptance control - the strict application of a waste acceptance procedure is critical to ensuring that unacceptable waste types do not enter the site and worker health and safety are not endangered.

Laboratory facilities - a suitably equipped site laboratory will be provided to undertake confirmatory testing of hazardous wastes accepted at the facility for treatment. A quality management system will also be implemented for the laboratory.

Standing/parking area for incoming trucks – parking area will be provided on site for trucks whilst confirmatory testing is carried out at the laboratory.

Materials recovery facility (MRF) - materials recovery facilities are facilities at which components of a mixed waste stream are extracted by the use of manual and mechanical separation techniques. MRFs may be high and low technology facilities, depending on the sophistication of plant and equipment employed and the numbers of staff working in the operation of the process. Typically, metals, mixed plastics, paper, glass, card and textiles are removed for recycling through the operation.

Waste treatment plant – incoming hazardous wastes will be classified in accordance with the new National Standards for Waste Classification and Management. These wastes will be treated accordingly to meet the new regulations.

Health care risk waste treatment – a hydroclave process will be used to treat all infectious wastes whilst a high temperature thermal process will be used to treat pathological wastes. All processes will be designed to the latest standards and will meet all the latest emission requirements.

Landfill facility – an engineered landfill will be constructed and operated in accordance with the Minimum requirements for waste disposal to landfill (DWAF, 1998). The landfill will also be lined in accordance with the latest standards in terms of the Revised waste classification system (2010).

Weather station – will be provided to monitor and record all meteorological data. This information will be used to manage all operations on the site in order to control any potential emissions from the site.

Security – the site will be provided with a suitable security system including fencing, access control and guarding to control and manage all access to the facility.

Roads – all on-site roads will be paved and maintained to minimise the generation of dust. Temporary or permanent gravel roads will be wetted to ensure proper dust suppression.

As part of the greening of the site, the undeveloped areas on the property will be appropriately fenced off and stocked with suitable game. Appropriate indigenous vegetation will also be planted on the site. The intention is to register the entire site as a nature conservancy and to utilise the site for educational purposes, both in terms of nature conservation and the industrial application of proper waste treatment and disposal. A precedent for this approach already exists and was successfully implemented at the Mariannhill landfill site near Pinetown in KwaZulu-Natal. The lead engineer of Envitech Solutions (Pty) Ltd for this project was directly responsible for all facets of the development of the Mariannhill landfill, from site selection, through to design, permitting and finally construction. He has also been involved in the successful implementation of a landfill gas to electricity project on the Mariannhill landfill site.

3. IDENTIFIED FEASIBLE AND REASONABLE ALTERNATIVES

In terms of Sections 28(1)(c) and 28(1)(j) of Regulation 543: Environmental Impact Assessment Regulations, 18 June 2010; read in conjunction with sections 24(5), 24M and 44 of the National Environmental Management Act (No 107 of 1998); it is a requirement to provide a description of any feasible and reasonable alternatives that have been identified. Alternatives are different means of meeting the general purpose and need of a proposal (DEAT, 2006) and can be categorised into the following (DEAT, 1998):

- demand alternatives (for example, using energy more efficiently rather than building more generating capacity),
- activity alternatives (for example, providing public transport rather than increasing road capacity),
- location alternatives (for example, either for the entire proposal or for components of the proposal, like the location of a processing plant for a mine),
- process alternatives (for example, the re-use of process water in an industrial plant, waste minimising or energy efficient technology, different mining methods),
- scheduling alternatives (for example, staggering the travelling to and from a plant during off peak times), and
- input alternatives (for example, use of alternative raw materials or energy sources).

The no-go alternative is the option of not undertaking the proposed activity or any of its alternatives. The no-go alternative also provides the baseline against which the impacts of other alternatives should be compared. It should be noted that the no-go alternative may sometimes not be a “real” or “implementable” alternative (for example, where the capacity of a sewage pipeline has to be increased to cope with current demand). It should, however, remain the default option and must always be included to provide the baseline for assessment of the impacts of other alternatives and also to illustrate the implications of not authorising the activity. (DEAT, 2006)

With all the categorised alternatives, the location (site) alternative normally plays the biggest role in assessment of an activity and its related impacts. As mentioned in Section 2 of this report, a site selection process was carried out in accordance with the Minimum Requirements for Waste Disposal by Landfill (DWAF, 1998) and is presented in Appendix B. Four sites were identified as candidate landfill sites, namely Blignautsrus, Meydustria, Walkerville and Vlakfontein (De Deur Brickworks). The outcome of this assessment is presented in Table 1 for the four sites (Envitech site selection report, Appendix B). In terms of the remainder of the categorised alternatives, the relevant processes employed at the proposed facility, together with scheduling and input variables; will play the next major role and will be assessed during the final design stages and the public participation process.

Table 1 Candidate landfill site ranking matrix.

Candidate site	Economic criteria				Environmental criteria					Public acceptance criteria				Total score
	Distance	Size	Access	Existing impact	Ground water	Surface water	Soil depth	Settling	Soil available	Distance	Visibility	Wind	Other	
B	1	4	4	1	4	4	4	4	4	3	1	1		35
M	4	4	4	2	4	4	4	4	3	3	2	2		40
W	3	2	4	4	4	4	3	3	2	2	2	2		35
V	4	4	4	4	4	4	4	4	4	3	3	3		45

B - Blignautsrus, M - Meydustria, W - Walkerville, V - Vlakfontein.
Ratings of 1 - 4 with 1 as low acceptance and 4 as high acceptance.

4. PROPERTY DESCRIPTION

The proposed project site is located on the disused De Deur Brickworks site which is located some 12 kms north of Vereeniging in Gauteng (see Google image in Appendix A and aerial photograph in Figure 1). In cadastral terms, the site comprises Portions 32, 84, 93 and 107 of the Farm Vlakfontein 546 IQ (see site cadastral plan in Appendix A). Access to the site is via a gravel road (Cronje Road), which is off the R82 (Vereeniging/Johannesburg Road).

The site has previously been used as a brickworks (for clay brick manufacturing) and an associated large, open pit excavation, from which residual dolerite clays were mined, occurs centrally within the site. Remnants of the brickworks infrastructure are located to the east of the open pit excavation, while the site offices are situated just off the main entrance, which is to the northeast. The site has also been used as a source of selected soil materials, and several shallow borrow pits exist adjacent to the large open pit excavation from which quartzite gravels and weathered bedrock have been excavated. Several borrow pits are also located along the southwestern site boundary, from which weathered shale bedrock has been previously sourced. See also

Water has accumulated at the base of the large, open pit excavation on the site as well as in the above-mentioned borrow pits along the southwestern site boundary. Site surveys have shown that the surface water level of the standing water is 1504m MSL in the open pit excavation, and varies between 1507m MSL and 1515m MSL within the borrow pits. This surface water is considered to be rainwater runoff.

The remainder of the site is undeveloped and relatively undisturbed. Electrical power lines, however, traverse the site in several places. The vegetative cover across the site comprises mainly grassland, with some dense thorn veldt in places. Across much of the southwestern portion of the site, particularly along the crest and slopes of the elevated ridge, quartzite boulders are heavily scattered across the surface.

The natural elevation of the site ranges from approximately 1506m MSL in the southeastern corner to approximately 1565m MSL at the highest point of the ridge in the southwest. The minimum elevation at the base of the open pit excavation is some 1504m MSL.

Figure 1 Aerial photograph of the site.

Drainage at the site is controlled by a stream flowing towards the east, and which is located approximately 300 m from the northeastern boundary of the site. Several small dams are located along this stream. No other surface water bodies were observed within or near to the site.

The site is substantially scarred and can therefore be considered as a “brown fields” site for development purposes. Substantial and costly remedial measures would be required to render to site suitable for any other use. See also the 1:50 000 topography maps and a topographical survey in Appendix A.

5. DESCRIPTION OF THE ENVIRONMENT

Graphical presentations of the environment for the Vlakfontein site are given in Appendix C for the following parameters:

- agricultural potential - given as moderate for approximately half the site area,
- ridges - Class 1 ridge identified in the northwestern area of the site,
- land cover - majority of the area presented by quarrying,
- hydrology - no major significant entities identified,
- vegetation map - site identified as Soweto Highveld grassland,
- ecological processes,
- sensitive features, and
- urban edge.

Tables with climate data for temperature, humidity, rain, wind speed and wind direction are given in Appendix D for 2009, measured at the Vereeniging weather station.

Two environmental parameters that will impact on all landfill-type activities are that of geology and hydrology of a proposed site. As part of the ongoing site investigations for the proposed activity, Envitech Solutions (Pty) Ltd has completed a geotechnical and hydrogeological investigation for the Vlakfontein site and the report is presented in Appendix E. Some of the relevant findings are presented in the following sections.

5.1 Geology

According to the 1:250 000 Geological Series for the area, the geology of the site comprises ferruginous shale, hornfels and ferruginous quartzite of the Timeball Hill Formation, which has been extensively intruded by dolerite (diabase) in the region. No major faults are indicated in the immediate vicinity of the site on the 1:250 000 Geological Series.

Based on the boreholes drilled during the hydrogeological investigation and the test pits excavated and exposures profiled during the geotechnical investigation, it is evident that the geology at the site can be broadly divided into geological zones. The first is the dolerite geological zone and comprises portions of the site into which the dolerite (or diabase) intrusion has occurred, while the second is the quartzite geological zone and comprises portions of the site where no intrusion of dolerite has taken place. A more detailed description of the two (2No) geological zones and the subsoil characteristics of each is given below.

5.1.1 Dolerite geological zone

The dolerite geological zone extends roughly across the northern "half" of the site. This geological zone essentially comprises residual and/or weathered Timeball Hill Formation quartzite overlying residual dolerite clays with weathered dolerite bedrock in places.

The lower residual quartzite clay, which was not always present, was found to achieve a maximum thickness of 0,5m and was typically described as *slightly moist, reddish brown, firm, medium to fine gravelly, fine and medium sandy CLAY with trace to abundant, hard rock quartzite gravels, cobbles and boulders.*

In places, the Timeball Hill quartzite unit remains in much less weathered form, and was typically described as *(W4/3) reddish to pale pink or grey blotched reddish, highly to medium weathered, closely jointed/fractured, medium to thinly bedded, medium hard to hard rock QUARTZITE.* Bedding of the quartzite was recorded dipping at 10^{o} towards the north in test pit TP13, while major sub-vertical joint/fracture sets were noted to be aligned E/W, NE/SW, NNE/SSW and N/S.

Beneath the Timeball Hill quartzite unit, and within the dolerite geological zone, residual dolerite clays were generally encountered. The residual dolerite clays were typically described as *very slightly moist, reddish to reddish brown to yellow brown to pale red/reddish orange blotched orange yellow, brown, dark orange, red and blackish, stiff to very stiff, fine and medium sandy CLAY to SANDY SILTY CLAY.* Slickensiding was observed in places within the residual dolerite clays. Soil profiles SP1 and SP2 indicated the presence of occasional to minor extremely soft to very soft rock corestones and/or scattered very soft to soft rock dolerite inclusions at depth within the residual dolerite clays.

Weathered dolerite bedrock, typically described as *(W5/4) greyish yellow speckled black, completely to highly weathered, very closely jointed, extremely soft rock with very soft rock corestones, medium to fine grained DOLERITE,* was observed at 7,5m depth in soil profile SP1. Weathered dolerite bedrock was also recorded in boreholes VF1 and VF2 at depths of 14m and 17m respectively.

In borehole VF1 the dolerite bedrock varied from *(W5) greenish yellow grey streaked dark grey and yellow, completely weathered, extremely soft rock DOLERITE* at 14m to *(W2) dark grey and dark greenish grey, slightly weathered, highly fractured, hard rock DOLERITE* from 17m to greater than 30m depth while in borehole VF2 the dolerite bedrock was described as *(W5) yellow brown, completely weathered, closely jointed, extremely soft rock DOLERITE with residual clay pockets* from 17m to 22m depth.

Borehole VF2 revealed that typically *(W3/2) pinkish purple to brown to grey to greenish grey, medium to slightly weathered, medium hard to hard rock, fine grained QUARTZITE* considered to be of the Rooihoogte Formation underlies the residual and/or weathered dolerite from a depth of 22m.

5.1.2 Quartzite geological zone

The quartzite geological zone extends roughly across the southern "half" of the site. This geological zone essentially comprises hillwash and/or residual quartzite overlying weathered Timeball Hill Formation quartzite and/or ferruginous shale. Rooihoogte Formation quartzites, sandstones, siltstones and shales underlie the Timeball Hill Formation conformably.

Hillwash materials generally cap the quartzite geological zone, and were found to extend to between 1,4m and in excess of 2,7m depth, being typically described as *very slightly moist, brown, loose to medium dense, slightly clayey, sandy, fine medium to coarse subrounded GRAVEL with scattered hard rock boulders*.

Beneath the hillwash materials, Timeball Hill quartzites and/or ferruginous shale described as *(W4/3) red to reddish grey to grey, highly to medium weathered, openly fractured, medium hard to hard rock, ferruginous QUARTZITE with abundant residual clay pockets* and *(W3) dusky yellow blotched red and stained orange brown, medium weathered, thinly bedded, medium to closely jointed, medium hard to hard rock, ferruginous SHALE* respectively.

Borehole BH VF3 revealed that Rooihoogte Formation units underlie the Timeball Hill Formation units from approximately 11m depth.

5.2 Geotechnical evaluation

5.2.1 Material distribution

Within the dolerite geological zone, the near-surface Timeball Hill quartzite unit generally comprises upper residual quartzite clays, gravelly ferricrete clays and lower "bouldery" residual soils. The thickness of this unit varies considerably; however, an average thickness of 2,0 m is inferred. In places, the Timeball Hill quartzite unit is in much less weathered form, and occurs as medium hard to hard rock quartzite (test pit TP13 and soil profile SP1 refer). It is inferred that this weathered quartzite rock has been targeted by the present land owners as a source of select material. Hence the shallow borrow pits adjacent and to the north of the large, open pit excavation on the site.

Within the quartzite geological zone, hillwash materials typically occur near-surface to depths in excess of 2,7 m. Timeball Hill Formation quartzites or ferruginous shales and Rooihoogte Formation quartzites, sandstones, siltstones and shales underlie the hillwash material successively.

5.2.2 Excavatability

Excavation of the residual clay materials is considered to classify as soft excavation in terms of SANS/SABS 1200. Excavations up to approximately 10 m depth are therefore expected to be easily achieved with a TLB or similar excavation plant. Where less weathered quartzite bedrock is encountered in places throughout the site, limited intermediate to hard rock excavation should however be expected.

5.2.3 Slope stability

Based on a preliminary appraisal of the residual clay subsoils, it is recommended that cuts within these materials should not exceed 1 vertical : 2 horizontal (26^{o}).

5.2.4 Material usage

Laboratory tests have indicated that the residual clay materials that occur at the site will be suitable for berm construction as well as covering layers. Furthermore, the permeability's in the order of 10^{-7} to 10^{-8} when compacted to 95% of Natural Mod AASHTO indicate that these soils are suitable for use as a natural clay liner or for use as a final capping. The plasticity indices of between 10% and 16% exceed the 10% requirement in the DWAF Minimum Requirements for compacted clay liners.

Natural materials suitable for constructing subsoil drains (for example, free draining sands or gravels) were not encountered on the site during the geotechnical or hydrogeological investigations. Materials for this purpose will therefore need to be imported from off the site.

The weathered quartzite bedrock as well as the hillwash materials should provide good selected material for road and/or pavement subgrade and sub-base materials.

5.2.5 Shallow or perched groundwater seepage

Neither shallow groundwater nor perched groundwater seepage conditions were encountered at the site during the geotechnical or hydrogeological investigations. The variable and inconsistent levels at which surface water was recorded in the open pit excavation and borrow pits on site suggests that the source of this water is not groundwater seepage, but from the accumulation of surface water runoff.

5.2.6 Undermining and subsistence

The area is not underlain by dolomitic rocks and mining activity has not been undertaken in the immediate vicinity. Undermining and/or subsidence are therefore not considered to be likely at the site.

5.3 Hydrogeological evaluation

5.3.1 Site hydrogeology

Groundwater seepage was recorded at a depth of 13 m in borehole BH VF1. Significant groundwater strikes, however, were recorded at depths of 17 m and 49 m in boreholes BH VF1 and BH VF3 respectively. No water seepages or groundwater strikes were recorded in borehole BH VF2 during the drilling of this borehole.

Average measurements of the static water depths in each of the boreholes taken between 20 May 2010 and 3 August 2010 indicate that the static groundwater table beneath the site varies between approximately 10 m and 30 m depth. This translates to average static water levels of between 1 500 m MSL and 1 509 m MSL.

Although groundwater flow direction was not measured, the static water levels recorded as well as the anticipated surface water movement (movement of groundwater generally mirrors that of surface water) indicate that groundwater flows beneath the site are expected to be in a northeasterly direction.

5.3.2 Water quality

In terms of physical, organoleptic and chemical requirements, drinking water quality is typically classified in accordance with SANS 241:2006 (Table 2). Two (2No) classes are identified *viz.* Class I and Class II. Class I water is deemed "acceptable for lifetime consumption" while Class II water is deemed "maximum allowable" in terms of the parameter limits and may be subject to consumption periods. Any parameter exceeding the limits of Class II water is deemed a failure (i.e. unacceptable quality) and poses a health risk to consumers.

A water quality analysis was undertaken on water samples retrieved from the two (2No) boreholes during the hydrogeological investigation. A classification of water quality in terms of SANS 241:2006 (Table 2) has been made, and it appears that the water quality in boreholes BH VF1 and BH VF32 is typically Class I. The exception to this being total chromium, the quantity of which fell within the Class II range in the sample from BH VF1 and exceeded the Class II limits in borehole BH VF3.

5.3.3 Aquifer classification

Based on the blow yields of the boreholes recorded during drilling, the potential sustained yield of the aquifer at the site is low. The water quality test results from the boreholes indicate that the aquifer beneath the site is of good quality (typically Class I water in terms of SANS 241:2006). In terms of significance, the aquifer is thus considered to be moderately yielding

5.3.4 Groundwater contamination potential

The naturally occurring low permeability, residual clays at the site are expected to provide good attenuation and retardation to any surface water infiltration.

6. APPLICABLE LEGISLATION

The legislation, policies and/or guidelines of any sphere of government that have been considered in the preparation of the scoping report, in terms of Section 28(1)(f) of Regulation 543: Environmental Impact Assessment Regulations, 18 June 2010; read in conjunction with sections 24(5), 24M and 44 of the National Environmental Management Act (No 107 of 1998); are presented in Table 2 and the references in Section 13 of this report.

7. ENVIRONMENTAL IMPACTS AND ASSESSMENT METHODOLOGY

The objective of the assessment of impacts is to identify and assess all the significant impacts that may arise from the undertaking of an activity and the findings used to inform the competent authority's decision as to whether the activity should be either authorised, authorised subject to conditions that will mitigate the impacts to within acceptable levels, or should be refused (DEAT, 2006). In this sense impacts are defined by DEAT (2006) as the changes in an environmental parameter that result from undertaking an activity. These changes are the difference between effects on an environmental parameter where the activity is undertaken compared to that where the activity is not undertaken, and occur over a specific period and within a defined area (DEAT, 2006).

7.1 Impact types

Different types of impacts may occur from the undertaking of an activity, which may be positive or negative, and can be categorised as being either direct (primary), indirect (secondary) or cumulative impacts. Direct impacts are impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity (for example, dust generated by blasting operations on the site of the activity).

Table 2 Applicable legislation, policies and/or guidelines.

Title of legislation, policy or guideline:	Administering authority:	Publication date:
Air quality activities regulations No 248	National and provincial	31 Mar 2010
Air quality standards regulations No 1210	National and provincial	24 Dec 2009
Conservation of Agricultural Resources Act (No 43 of 1983)	National and provincial	21 Apr 1983
Constitution of the Republic of South Africa Act (No 108 of 1996)	National and provincial	18 Dec 1996
Development Facilitation Act (No 67 of 1995)	National and provincial	1995
EIA Regulations Nos 543, 544, 545 and 546	National and provincial	18 Jun 2010
EIA Regulations Nos 660, 661, 662, 663 and 664	National and provincial	30 Jul 2010
Environment Conservation Act (No 73 of 1989)	National and provincial	1 Jun 1989
National Environmental Management Act (No. 107 of 1998)	National and provincial	27 Nov 1998
National Env Management Amendment Act (No 56 of 2002)	National and provincial	15 Jan 2003
National Env Management Amendment Act (No 46 of 2003)	National and provincial	13 Feb 2004
National Env Management Amendment Act (No 8 of 2004)	National and provincial	14 Jul 2004
National Env Management Amendment Act (No 62 of 2008)	National and provincial	3 Jan 2009
NEMA implementation guidelines Notice 603	National and provincial	18 Jun 2010
National Env Management: Air Quality Act (No 39 of 2004)	National and provincial	24 Feb 2004
National Env Management: Waste Act (No 59 of 2008)	National and provincial	10 Mar 2009
National Heritage Resources Act (No 25 of 1999)	National and provincial	1999
National Water Act (No 36 of 1998)	National and provincial	26 Aug 1998
Occupational Health and Safety Act (No 85 of 1993)	National and provincial	23 Jun 1993
Promotion of Access to Information Act (No 2 of 2000)	National and provincial	2000
Waste management activities regulations No 718	National and provincial	3 Jul 2009

These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable. However, indirect impacts are induced changes that may occur as a result of the activity (for example, the use of water from a natural source at the activity will reduce the capacity for supply to other users). These types of impacts include all the potential impacts that either do not manifest immediately when the activity is undertaken, or which occur at a different place as a result of the activity. (Jain *et al.*, 1993; Fuggle and Rabie, 1994; DEAT, 2006)

Cumulative impacts are impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities (for example, removal of vegetation may cause soil erosion, leading to excessive sediments in a receiving stream, leading to reduced sunlight penetrating the water and thus reducing dissolved oxygen in the water and adversely affecting aquatic life and water quality). Cumulative impacts can occur from the collective impacts of individual minor actions over a period of time and can include both direct and indirect impacts. (Jain *et al.*, 1993; DEAT, 2006)

7.2 Identification of impacts

The identification of the potential impacts of an activity on the environment should include impacts that may occur during the start/construction, operation and decommissioning/ rehabilitation phases of an activity (DEAT, 2006). The process of identification and assessment of impacts includes, *inter alia*, the (Jain *et al.*, 1993; DEAT, 2006):

- determination of current environmental conditions in sufficient detail so that there is a baseline against which impacts can be identified and measured;
- determination of future changes to the environment that will occur if the proposed activity does not take place;

- understanding of the activity in sufficient detail to understand its consequences; and
- identification of significant impacts that are likely to occur if the activity is undertaken.

7.3 Impact mitigation

Once impacts have been identified and predicted for a particular activity, appropriate mitigation measures need to be established (DEAT, 2006). Mitigation measures are the modification of certain activities in such a way as to reduce the impacts on the environment (Jain *et al.*, 1993). The objectives of mitigation are to (DEAT, 2006):

- find more environmentally sound ways of doing things;
- enhance the environmental benefits of a proposed activity;
- avoid, minimise or remedy negative impacts; and
- ensure that residual negative impacts are within acceptable levels.

When mitigation is considered for (certain) impacts, it should be organised in a hierarchy of actions, namely (DEAT, 2006):

- avoid negative impacts as far as possible though the use of preventative measures,
- minimise or reduce negative impacts to “as low as practicable” levels, and
- remedy or compensate for negative residual impacts that are unavoidable and cannot be reduced further.

7.4 Proposed activity environmental impacts

Certain impacts of the proposed activity on the environment can be identified during this scoping phase. These identified impacts will also provide an indication of the subsequent specialist studies required, as discussed in Section 10 of this report, and are as follows (note that although some mitigation measures are mentioned, more detailed measures will be presented during the environmental assessment phase and in many cases will negate listed impacts):

- possible loss of flora and fauna communities - based on the brown field condition of the site, this is not likely;
- land use capabilities - based on the present condition of the site ex-quarrying, no additional degradation foreseen and the rehabilitation of worked out areas will benefit the environment;
- odour and noise impacts - mitigation measures, both through designed abatement methodologies and operational procedures, should minimise and/or negate these impacts;
- air quality - dust creation from delivery vehicles (paving and maintenance of roads should mitigate this impact) and potentially harmful airborne emissions from thermal waste treatment (the use of world class equipment with associated abatement technologies should address this impact adequately);
- archaeological, heritage and cultural aspects - no immediate impacts are recognised at present;
- sensitive landscapes and visual aspects - due to the lay of the land, sense of place (Barnard *et al*., 2006) issues should not play any significant role;
- social environment - additional workforce during construction and operational phases of the proposed project will impact on the present social environment;;

- water pollution - possible pollution of ground and surface water should be negated by adherence to present and proposed legislation with regard to liner systems and water management principles; and
- economic impacts - positive impacts should result for the local community with the generation of more jobs in the area.

7.5 Impact assessment methodology

The concepts for environmental impact assessments in this report will relate to risk assessment (the process whereby certain impacts to the environment are identified), risk valuation (by using a stipulated assessment criteria whereby impacts are given a rating or weighting and obtaining an overall rating or significance of an impact) and risk management (relating directly to applicable mitigation measures to be implemented to manage a risk of an impact in the "best" interest of a society; Shogren, 1990). Such an assessment is also a requirement in terms of Section 31(2)(l) of Regulation 543: Environmental Impact Assessment (EIA) Regulations, 18 June 2010; read in conjunction with sections 24(5), 24M and 44 of the National Environmental Management Act (No 107 of 1998). The guideline criteria set out in the EIA regulations, in conjunction with assessment criteria from DEAT (1998), Friend *et al.* (2005), DEAT (2006) and Friend and Van Rooyen (2009); will be followed in this report and are presented in the following sections.

7.5.1 Nature or status of the impact

An appraisal of the type of effect the activity would have on the affected environment; rated as either positive (beneficial impact on the environment), neutral (no impact on the environment), or negative (adverse impact on and at a cost to the environment).

7.5.2 Extent or scale of the impact

Indicates whether the impact will be either site specific (impacting within the boundaries of the site), local (within an area of 5 km of the site), regional (Gauteng Province), on a national scale (South Africa) or across international borders (Southern Africa).

7.5.3 Duration of the impact

Indicates whether the lifetime of the impact will be either short term (0 - 5 years), medium term (5 - 15 years), long term (where the impact will cease after the operational life of the activity, either because of natural process or human intervention), or permanent (where mitigation either by natural process or human intervention will not occur in such a way or in such a time span that the impact can be considered transient).

7.5.4 Intensity or magnitude of the impact

Establishes whether the impact is destructive or benign and is indicated as either low (where the impact affects the environment in such a way that natural, cultural and social functions and processes are not affected), medium (where the affected environment is altered but natural, cultural and social functions and processes continue, albeit in a modified way), high (natural, cultural or social functions or processes are altered to the extent that it will temporarily cease); or very high (natural, cultural or social functions or processes are altered to the extent that it will permanently cease).

7.5.5 Probability of the impact

Describes the likelihood of the impact actually occurring and is indicated as either improbable (the possibility of the impact to materialise is very low, either because of design, historic experience or implementation of adequate corrective actions), probable (there is a distinct possibility that the impact will occur), highly probable (it is most likely that the impact will occur), or definite (the impact will occur regardless of any prevention or corrective actions).

7.5.6 Determination of significance

After assessment of an impact in accordance to the preceding five criteria, the significance of an impact can be determined through a synthesis of the aspects produced in terms of their nature, extent, duration, intensity and probability. In Table 3 various ratings are accorded to these criteria. These ratings are now used to calculate a significance (S) rating and is formulated by adding the sum of ratings given to the extent (E), duration (D) and intensity (I) and then multiplying the sum with the probability (P) of an impact as follows:

$$\text{Significance (S)} = (E + D + I) \times P$$

The resultant ratings are now described as follows (see also Table 3):

- S < 25 implies a low impact (meaning this impact would not have a direct influence on the decision to develop in the area),
- S = (25 - 50) implies a medium impact (where the relevant impact could influence the decision to develop in the area unless it is effectively mitigated), and
- S > 50 implies a high impact (this impact must have an influence on the decision process to develop in the area).

Table 3 Ratings used for determining impact significance.

Nature of impact (N)	
positive	+
neutral	0
negative	-

Extent of impact (E)	
site specific	1
local	2
regional	3
national	4
international	5

Duration of impact (D)	
short term	1
medium term	2
long term	3
permanent	4

Intensity of impact (I)	
low	1
medium	2
high	3
very high	4

Probability of impact (P)	
improbable	2
probable	4
highly probable	6
definite	8

Significance of impact (S)	
low	< 25
medium	25 - 50
high	> 50

7.5.7 Additional evaluation criteria

Apart from the assessment criteria presented in the preceding sections; impacts will also be evaluated and assessed based on cumulative impacts, relevant reversibility, potential for irreplaceable loss of resources and level of confidence.

Cumulative impacts (see Table 4) can arise from one or more activities and can be defined as being either an additive impact, that is where it adds to the impact caused by other similar impacts; or an interactive impact, that is where a cumulative impact is caused by different impacts that combine to form a new impact. Interactive impacts may cause either countervailing (the nett adverse cumulative impact is less than the sum of the individual impacts), or synergistic (the nett adverse cumulative impact is greater than the sum of the individual impacts). (DEAT, 2006)

The reversibility of an impact simply indicates to what degree its influence on the relevant environment can be negated and is presented in Table 4. The potential for irreplaceable loss of resources, based on a relevant impact, indicates the degree to which the impact may cause such loss and is presented in Table 4.

Table 4 Additional assessment criteria.

Cumulative impacts	
none expected	no
additive	yes
interactive countervailing	int cou
interactive synergistic	int syn

Reversibility of impacts	
complete	yes
intermediate	probably
not possible	no

Potential for resource loss	
will not take place	no
there is a possibility of this happening	probably
this will definitely happen	yes

Level of confidence	
No uncertainty is associated with the prediction of the impact and all necessary information was available.	definite
The prediction was based on virtually all necessary information being available, with the exception of insignificant information that will not materially affect the outcome of the prediction.	high
Although the majority of the necessary information was available, there is some uncertainty associated with the impact predicted.	medium
There is a high degree of uncertainty associated with the impact predicted as certain key information was unavailable at the time of the prediction.	low

The level of confidence indicates the level of certainty that specialists have in the accuracy of their predictions with regard to a relevant assessment and its related determined significance. This will be based on any factors that could bring into doubt the accuracy of their relevant predictions, (for example, an investigation undertaken during a non-ideal season, key research data being unavailable) and thus compromise the level of confidence in the assessment of an impact. The levels of confidence used in this report are presented in Table 4 and for levels with either a medium or low level applicable, an additional explanation will be provided as to what the relevant impacting factors were.

7.5.8 Impact assessment presentation

All relevant impacts on the environment are rated and evaluated as set out in the preceding sections and presented via impact tables. It should be noted that impacts are evaluated after mitigation measures, where relevant and indicated as such in the impact tables, have been taken into account. The project impacts are further subdivided into the following three phases*, from which impacting activities can be identified (DEAT, 1998):

- construction phase – all activities on and off site, including the transport of material,
- operational phase – all activities, including operation and maintenance of structures, and
- decommissioning/rehabilitation phase – any activity related to the physical dismantling of the structures and/or restoring of process/mining land to some degree of its former state.

* note that while planning and design is recognised as a project phase, it is for this project and generally for most projects, of no negative impact significance.

8. PUBLIC PARTICIPATION PROCESS

In terms of Section 28(1)(h) of Regulation 543: Environmental Impact Assessment Regulations, 18 June 2010; read in conjunction with sections 24(5), 24M and 44 of the National Environmental Management Act (No 107 of 1998); it is a requirement to provide details of the public participation process conducted in accordance with Section 54 of the EIA regulations. Although the term stakeholder engagement is gaining acceptance worldwide as a replacement for the term public participation (DEAT, 2002), this is still the terminology used within the EIA regulations and will be utilised throughout the report where relevant. Clarification of the term public versus stakeholder is provided in Figure 2 (DEAT, 2002).

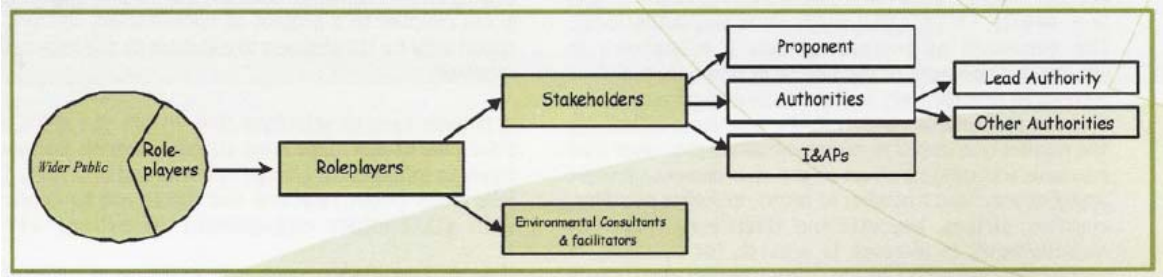

Figure 2 Clarification of the term "public" versus "stakeholder".

Public participation forms an integral part of any present day environmental assessment process. The objectives of public participation can be summarised as follows (Lakhani, 2000):

- informing stakeholders;
- presentation of views, concerns and values;
- maximising benefits and minimising risks;
- influencing project design;
- obtaining local knowledge;
- increasing public confidence;
- better transparency and accountability in decision-making; and
- less conflict (decision-making through consensus).

In order to address these objectives, an information exchange meeting was held between representatives of the Emfuleni Local Municipality and the Vlakfontein waste treatment facility project team on 23 August 2010 at the offices of the Department of Development and Planning in Vanderbijlpark. During this meeting the project team gave a presentation of the proposed activity, and obtained feedback and suggestions from representatives of the Emfuleni Environmental, Health, Waste Management and Development and Planning departments representatives present at the meeting.

In addition to the above, the various other actions required for public participation, in terms of Section 54 of the EIA regulations, are set out in the following sections.

8.1 Notification of potentially interested and affected parties

The requirements for the notification of potentially interested and affected parties of this application are set out in detail in Section 54(2)(b) of Regulation 543: Environmental Impact Assessment Regulations, 18 June 2010. These requirements have been addressed and include, *inter alia*,

- forwarding a letter to the owner of the land in terms Sections 15(1) and 54(2)(b) of the EIA Regulations (see Appendix F for letter and proof of receipt);
- hand delivery and posting of written notices to owners and occupiers of land adjacent to the site (see Appendix F for the written notice forwarded);
- forwarding letters to Emfuleni Local Municipality Departments of Environmental, Health, Waste Management and Development and Planning (see Appendix F for copies of these letters);
- fixing of notice boards at places conspicuous to the public; and
- placing of advertisements in one local and one provincial newspaper.

8.2 Proof of notice boards, advertisements and notices

Proof of the placement of notice boards is given in Figures 3 and 4. The advertisements placed in the Vaal Weekblad local newspaper on 22 September 2010 and The Star provincial newspaper on 17 September 2010 are presented in Figures 5, and 6 respectively. The register of all parties that were informed of the activity is given in Appendix F, as well as a signed affidavit proving delivery of said notices.

8.3 Register of interested and affected parties

Together with the written notification register, an interested and affected parties register has been opened, as required in terms of Section 55(1) of the EIA regulations, and the present edition is presented in Appendix F.

8.4 Summary of issues raised by interested and affected parties

Written comments on the project and the draft scoping report were received from interested and affected parties (stakeholders), with the written comments received presented in Appendix H, and a consolidation of stakeholder's feedback and project team responses provided in Appendix I.

9. NEED AND DESIRABILITY OF THE PROPOSED ACTIVITY

At present in South Africa there is an immediate need for appropriate waste treatment facilities for both hazardous wastes and health care risk wastes (HCRW). In particular, there would appear to be a shortage of HCRW treatment facilities on a national scale that comply with current air quality regulations. It is an acknowledged fact that the HCRW industry is in crisis with numerous incidents being reported nationally in the media, of illegal dumping and disposing of HCRW. This has resulted in a number of prosecutions that are still ongoing. The Waste Giant group have been involved in the cleanup of a significant number of these illegal disposal sites.

As a result of the above and the need to provide modern waste treatment and disposal facilities for many of their industrial clients, it was determined that a waste disposal facility was required to be located in the Johannesburg/Sasolburg/Vereeniging area.

The present site can be classified as a brown field site and the proposed development on the disused brickworks site can therefore be seen to not only provide a waste treatment facility, which is in serious demand - particularly when considering the rigorous requirements of the new Waste Act, but also effecting a rehabilitation process for the significantly disturbed site to be included in an environmental conservancy. As mentioned earlier, part of the greening of the site will involve appropriately fencing off the area, stocking it with suitable game and planting of appropriate indigenous vegetation to ultimately register the entire site as a nature conservancy and to utilise the site for educational purposes, both in terms of nature conservation and the industrial application of proper waste treatment and disposal. (As was the case with the successful implementation of a similar scenario at the Mariannhill landfill site near Pinetown in KwaZulu-Natal.)

Although the site is currently not being used for agricultural purposes, the areas not disturbed by the brick making operations, would appear to be only suitable for grazing on a very limited scale. Due to the geology of the site, the soils would not appear to be suitable for crop farming. The final rehabilitated site would therefore only be suitable for agriculture in terms of grazing and would be best suited for use as a nature conservancy.

The proposed project will lead also to social benefits in the form of significant increased employment opportunities on the project itself, particularly, with respect to waste separation and recycling. It will also create some multiplier spin-offs through the civil engineering construction and other inputs required.

Figure 3 Site notice placed at entrance to site.

Figure 4 Site notice placed at entrance road to site.

Vaal weekblad

R3,90 (BTW Ingesluit) 22 - 24 September 2010 Tel.(016) 950-7000

Regskennisgewings

ENVIRONMENTAL IMPACT ASSESSMENT PROCESS FOR THE CONSTRUCTION OF A WASTE TREATMENT FACILITY AT VLAKFONTEIN

Notice is hereby given in terms of Section 54 of Regulation 543 (EIA regulations of 18 June 2010); read in conjunction with Sections 24 and 44 of the National Environmental Management Act (No 107 of 1998, NEMA), and Regulation 718 (Waste management activities regulation of 3 July 2009) read in conjunction with Section 19 of the National Environmental Management: Waste Act (No 59 of 2008); of the intention of Waste Giant Landfill (Pty) Ltd to apply for a waste management licence for the construction of a waste treatment facility from the competent authority (National Department of Environmental Affairs) on the property Portion 32, 84, 93, 107 and 187 of Vlakfontein 546IQ. In accordance to Section 4 of Regulation 718 and activity No 5 of Regulation 545 of 18 June 2010, an environmental impact assessment process (scoping procedure) must be conducted, as stipulated in the EIA regulations made under Section 24(5) of NEMA as part of a waste management licence application.

In order to register as an interested and affected party, obtain further information and / or submit comments (written, faxed or via e-mail) by no later than Friday, 29 October 2010; please contact Francois Friend of Softchem at either P.O. Box 1525, North Riding, 2162; fax 086 657 1612, e-mail francois@softchem.co.za, or cell 082 554 8900.

A public meeting / exhibit will be held at the site on 19 October between 15:00 to 19:00.

29574-37

Regskennisgewings

Figure 5 Actual advertisement placed in the Vaal Weekblad of 22 - 24 September 2010.

The Star

The Star, FRIDAY SEPTEMBER 17, 2010

ENVIRONMENTAL IMPACT ASSESSMENT PROCESS FOR THE CONSTRUCTION OF A WASTE TREATMENT FACILITY AT VLAKFONTEIN

Notice is hereby given in terms of Section 54 of Regulation 543 (EIA regulations of 18 June 2010); read in conjunction with Sections 24 and 44 of the National Environmental Management Act (No 107 of 1998, NEMA), and Regulation 718 (Waste management activities regulation of 3 July 2009) read in conjunction with Section 19 of the National Environmental Management: Waste Act (No 59 of 2008); of the intention of Waste Giant Landfill (Pty) Ltd to apply for a waste management licence for the construction of a waste treatment facility from the competent authority (National Department of Environmental Affairs) on the property Portion 32, 84, 93, 107 and 187 of Vlakfontein 546IQ. In accordance to Section 4 of Regulation 718 and activity No 5 of Regulation 545 of 18 June 2010, an environmental impact assessment process (scoping procedure) must be conducted, as stipulated in the EIA regulations made under Section 24(5) of NEMA as part of a waste management licence application.

In order to register as an interested and affected party, obtain further information and/or submit comments (written, faxed or via e-mail) by no later than Friday 29 October 2010; please contact Francois Friend of Softchem at either PO Box 1525, North Riding, 2162; fax 086 657 1612, e-mail francois@softchem.co.za, or cell 082 554 8900.

A public meeting / exhibit will be held at the site on 19 October between 15:00 to 19:00.

(STAR 7843417)

Figure 6 Actual advertisement placed in The Star newspaper of 17 September 2010.

The company will provide an undertaking to employing all of the labour required for the project from within nearby disadvantaged communities. A number of opportunities will also prevail for the training of skilled operators with respect to the management and operations of the treatment plants and landfill. It is anticipated that this project will generate in excess of 90 new jobs. The final figure could be higher, depending on the final sizing and configuration of the various treatment plants.

10. PLAN OF STUDY (TERMS OF REFERENCE)

It is a requirement in terms of Section 28(1)(n) of Regulation 543: Environmental Impact Assessment Regulations, 18 June 2010; read in conjunction with sections 24(5), 24M and 44 of the National Environmental Management Act (No 107 of 1998); to include a plan of study for environmental impact assessment that sets out the proposed approach to the environmental impact assessment of the application. As the proposed activity resort under the National Environmental Management: Waste Act (No 59 of 2008), the plan of study must also be aligned to the requirements stipulated by Regulation 718 of 3 July 2009 that deals with the listing of waste management activities.

10.1 Description of tasks to be undertaken for environmental impact assessment process

The process followed in terms of the waste licence application, with the associated tasks, can be summarised in Stages A to G as follows:

- Appointment of EAP by the relevant applicant. [A]
- Confirmation of current/correct version of the waste licence application form, determining whether basic assessment or scoping is to be applied to the application, and confirmation of relevant competent authority to submit the application. [B]
- Completion of waste licence application, initiation of public participation process, meeting with local authorities and scoping report. [C]
- Handing in of waste licence application and scoping report to relevant competent authority, and consultation with competent authority. [D]
- Receive feedback/decision from competent authority, possibly have another consultation with competent authority if required, and if scoping report has been accepted; proceed with the relevant specialist investigations and public participation process. [E]
- Based on specialist investigation reports, interested and affected parties' feedback, the environmental impact assessment report is completed and handed in to the competent authority. [F]
- Receive feedback/decision from the competent authority with regard the environmental impact assessment report and ultimately the waste licence application. [G]

10.2 Investigations to be completed for environmental impact assessment

Use will be made of specialists to conduct a number of investigations. The various aspects that will be addressed for the environmental impact assessment to make an objective assessment of the proposed activity and any related alternatives, including the no-go option, are as follows:

- climate,
- geology,
- topography,
- land use capabilities,
- hydrology,

- air quality,
- natural vegetation,
- animal life,
- archaeological, heritage and cultural aspects,
- sensitive landscapes and visual aspects,,
- noise and odour,
- social and economic environment, and
- occupational health and safety.

10.3 Indication of the stages for competent authority consultation

During Stage B for confirmation of administrative detail, Stage C for discussions with local authorities as to the need for the proposal and other suggestions, Stage D during handing in of documentation, Stage E during the authority's feedback, and any other stages if so required by the competent authority.

10.4 Description of assessment methodology

The proposed method of assessing the environmental issues and alternatives, including the option of not proceeding with the activity, is set out in Section 7.5 of this report.

10.5 Particulars of the public participation process

The public participation process that will be conducted during the environmental impact assessment process will follow the requirements set out in Section 54 of the EIA regulations, as well as the guidelines published as part of the Integrated Environmental Management Guideline Series (No 7) published on 18 June 2010. These will include, inter alia,

- notification of potential interested and affected parties (IAPs) of the proposed activity and the publication of draft reports,
- placement of notice board and advertisements in local and regional newspapers,
- having an open day/meeting for IAPs on site,
- maintaining an interested and affected parties register, and
- informing IAPs of any new information forthcoming during the environmental impact assessment process.

11. DETAILS OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER

In terms of Section 28(1)(a) of Regulation 543: Environmental Impact Assessment Regulations, 18 June 2010; read in conjunction with sections 24(5), 24M and 44 of the National Environmental Management Act (No 107 of 1998); it is a requirement to provide details of the environmental assessment practitioner (EAP) who prepared the report and the expertise of the EAP to carry out scoping procedures. This is provided in the following sections under general information, experience and related publications.

11.1 General information

Name:	John Francois Curling Friend
Education:	BEng (Chem) Pretoria 1986
	MSc (Eng) Cape Town 1991
	Dip MktM IMM 1995

Affiliations: FSAIChE (Fellow, South African Institution of Chemical Engineers)
FIChemE (Fellow, United Kingdom Institution of Chemical Engineers)
FWISA (Fellow, Water Institute of South Africa)
FIWM(SA) (Fellow, Institute of Waste Management of Southern Africa)

Registrations: PrEng (Professional Engineer, Engineering Council of South Africa)
CEng (Chartered Engineer, United Kingdom Engineering Council)

Specialisation: Water management, treatment and recycling. Air quality and waste management. Environmental management, economics, assessments and auditing. Technical audits and effluent treatment. Specialised computer applications.

11.2 Experience

1991 - Present
Softchem, founder member. Waste management (Eloptro), water management (Sasol Mining and Eskom), water treatment dedicated software (Anglo American Research Laboratories and Veolia Eau in France), functional specifications and operating manuals for water treatment plants (Saldanha Steel as subcontractor to DB Thermal), technical and environmental auditing (Eskom), environmental impact assessments (including public participation meetings) and evaluations (ABI/Coca-Cola, Necsa, Paladin Resources/Langer Heinrich Uranium and Gautrans), environmental management programme report (Eurocoal), environmental consulting and ISO 14001 environmental system implementation (Eskom, Midvaal Water Company and Vametco Alloys).

2005 - Present
SI Analytics (Pty) Ltd., Director Operations and Projects. Supplying air monitoring equipment to industry and government.

1997 - Present
Waterops (Pty) Ltd., Director: Operations and Marketing. Water treatment plant operations and troubleshooting, through Thermax representation supply of various chemicals and ion exchange resins.

1998 - 2007
University of Pretoria, Department of Chemical Engineering, Senior Lecturer. Responsible for the Environmental Engineering Group lecturing environmental engineering and postgraduate courses in environmental management, air quality management, waste management, air pollution control and water management.

1992 - 1998
Eskom Technical Audit Division, Chief Consultant (Water Management). Project leader for a variety of multi disciplinary audit projects. Environmental management and audits. Water management and treatment. SAATCA registered lead auditor. Chairman Eskom Waste Management Forum. International exposure in water treatment and flue gas desulphurisation through extended overseas visits to Japan, USA, United Kingdom, France and Germany.

1990 - 1992
Eskom Chemical Engineering Division, Design Engineer. Water management studies at numerous power stations and external to Eskom, eg Soda Ash Botswana. Effluent treatment plant design.

1988 - 1990
Koeberg Nuclear Power Station, Engineer in Training. Water treatment plant operation and troubleshooting, sodium hypochlorite production, sewage treatment and water chlorination plants, ion exchange resins.

1985 - 1986
Eskom Chemical Engineering and Chemistry Division, Engineering Assistant. Air pollution, flue gas desulphurisation processes, boiler acid cleaning. (National military service: 1986 - 1988).

11.3 Related publications*

BARNARD D, BARNARD C, FRIEND JFC and VISSER D (2003) *Roadmap to environmental legislation*. Impact Books, Pretoria, South Africa. ISBN 0-620-31028-6.

BARNARD D, BARNARD C, FRIEND JFC and VISSER D (2005) *Roadmap to environmental legislation - Edition 2.* Impact Books, Pretoria, South Africa. ISBN 0-620-31028-6.

BARNARD D, FRIEND JFC, BARNARD C and VISSER D (2006) *Roadmap to environmental legislation - Edition 3.* Impact Books, Pretoria, South Africa. ISBN 0-620-37673-2.

CAWOOD BL and FRIEND JFC (2005) Evaluation of 38 years of radiological environmental data for the nuclear research facility in South Africa. *Journal of Environmental Radioactivity*, **79**, 255 - 271.

DE BEER PJ and FRIEND JFC (2006) Environmental accounting: a management tool for enhancing corporate environmental and economic performance. *Ecological Economics*, **58**, 548 - 560.

FRIEND JFC (1993) *Management in a changing environmental sphere.* Technology Leadership Programme dissertation, Eskom, Johannesburg, South Africa.

FRIEND JFC (1996) Formulating and developing an environmental auditing system to add value to your business. Paper presented at the *Industrial Waste Management Solutions - 6th Annual Waste Management symposium*, 22 - 23 January 1996, Johannesburg, South Africa.

FRIEND JFC (1996) A practical guide to conducting environmental audits. Paper presented at the *Environmental Systems Standards and Auditing conference*, 20 - 21 May 1996, Johannesburg, South Africa.

FRIEND JFC (1997) Environmental audit - process and methodology. Paper presented at the *Conducting and Managing Environmental Audits conference*, 23 - 24 October 1997, Johannesburg, South Africa.

FRIEND JFC (2001) Possible solutions to the challenges facing environmental management in a first/third world developing country. Paper presented at the *6th World Congress of Chemical Engineering*, 23 - 27 September 2001, Melbourne, Australia. [Conference proceedings ISBN 0 7340 2201 8.]

FRIEND JFC (2003) The Blue Model, education and effective environmental management in South Africa. Paper presented at the *Building Capacity for Impact Assessment, 23rd International Association for Impact Assessment (IAIA) conference*, 17 – 20 June 2003, Marrakech, Morocco.

FRIEND JFC (2003) Water balances – an essential environmental tool for power stations. Paper presented at the *CHEMECA 2003, 31st Australasian Chemical Engineering conference*, 28 September – 1 October 2003, Adelaide, Australia. [Conference proceedings ISBN 0 86396 829 5.]

FRIEND JFC (2003) *Environmental management in South Africa: the Blue Model.* Impact Books, Pretoria, South Africa. ISBN 0-620-31258-0.

FRIEND JFC (2004) Practical implementation of environmental legislation in a first/third world country. Paper presented at the *24th International Association for Impact Assessment (IAIA) conference*, 24 – 30 April 2004, Vancouver, Canada.

FRIEND JFC (2005) Assessment criteria for determining environmental impact significance ratings. Paper presented at the *25th International Association for Impact Assessment (IAIA) conference*, 31 May - 3 June 2005, Boston, United States of America.

FRIEND JFC (2005) Selected studies for the proposed establishment of the Zone of Integration residential township. *Softchem confidential report*, No KWPREP/2005/01, December 2005, Johannesburg, South Africa.

FRIEND JFC (2008) Environmental and Process Solutions third party hazard classification for Lanxness feasibility study. *Softchem confidential report*, No EPSREP/2008/01, April 2008, Johannesburg, South Africa.

FRIEND JFC, BORSHOFF J, PRETORIUS LE, MARSH D, SIEBERT T, SLABBERT J, VAN ROOYEN N, DU TOIT L, KVASNICKA J, SPEISER A, KINAHAN J, POTGIETER F, BUTCHER D and VAN RENSBURG J (2004) Langer Heinrich Uranium Mine environmental assessment draft report. *Softchem report*, No LHUEA2004.01, October 2004, Johannesburg, South Africa.

FRIEND JFC, BORSHOFF J, PRETORIUS LE, MARSH D, SIEBERT T, SLABBERT J, VAN ROOYEN N, DU TOIT L, KVASNICKA J, SPEISER A, KINAHAN J, POTGIETER F, BUTCHER D and VAN RENSBURG J (2005) Langer Heinrich Uranium Mine environmental assessment final report. *Softchem report*, No LHUEA2005.01, April 2005, Johannesburg, South Africa.

FRIEND JFC, NELL LR, GOOSEN AJ and CONLIN JB (1997) An environmental assessment of water management at Eskom coal fired power stations. Paper presented at the *Power Plant and Environment 1997 VGB conference*, 16 - 17 April 1997, Düsseldorf, Germany.

FRIEND JFC, NELL LR, GOOSEN AJ and CONLIN JB (1998) An environmental assessment of water management at Eskom coal fired power stations. *VGB PowerTech*, **78**(9), 71 - 74.

FRIEND JFC and VAN ROOYEN N (2009) Environmental risk analysis for the NECSA proposed water and effluent infrastructure upgrade. *Softchem public access report*, No EIMSREP/2009/01/R4, June 2009, Johannesburg, South Africa.

FRIEND JFC and VAN TONDER H (2007) GAUTRANS basic assessment report for upgrading of Lynnwood Road. *Gauteng Department of Agriculture, Conservation and Environment public access report*, No GAUT 002/07 - 08/N0242, August 2007, Johannesburg, South Africa.

FRIEND JFC, VENTER C, POTGIETER F and McGEE D (2003) NECSA Pelindaba evaluation of the environmental monitoring programme report. *Softchem confidential report*, No NECSA/REP/2003/03, July 2003, Johannesburg, South Africa.

HATTINGH J and FRIEND JFC (2003) Environmental and economic implications of slag disposal practices by the ferrochromium industry: A case study. *Water SA*, **29**(1), January 2003, 23 - 30.

MILLS JE, HANSEN AD and FRIEND JFC (2009) Monitoring black carbon, its role in climate change and air pollution. Paper presented at the *National Association for Clean Air (NACA) conference*, 14 - 16 October 2009, Vanderbijlpark, South Africa.

* additional publications available from the website www.softchem.co.za.

12. SPECIFIC INFORMATION REQUIRED BY COMPETENT AUTHORITY

As part of the waste licence application, an operating manual for the proposed activity must also be handed in. The current draft is presented in Appendix F.

13. REFERENCES

BARNARD D, FRIEND JFC, BARNARD C and VISSER D (2006) *Roadmap to environmental legislation - Edition 3.* Impact Books, Pretoria, South Africa. ISBN 0-620-37673-2.

DEAT (DEPARTMENT OF ENVIRONMENTAL AFFAIRS AND TOURISM) (1998) EIA regulations – implementation of sections 21, 22 and 26 of the Environment Conservation Act. *Department of Environmental Affairs and Tourism guideline document*, April 1998, Pretoria.

DEAT (DEPARTMENT OF ENVIRONMENTAL AFFAIRS AND TOURISM) (2002) Stakeholder engagement, integrated environmental management information series 3. *Department of Environmental Affairs and Tourism guideline document*, Pretoria.

DEAT (DEPARTMENT OF ENVIRONMENTAL AFFAIRS AND TOURISM) (2006) Guideline 5: Assessment of alternatives and impacts in support of the environmental impact assessment regulations. *Department of Environmental Affairs and Tourism guideline document*, June 2006, Pretoria.

DWAF (DEPARTMENT OF WATER AFFAIRS AND FORESTRY) (1998) Minimum requirements for waste disposal by landfill, Second Edition. *Department of Water Affairs and Forestry guideline document*, Pretoria.

FRIEND JFC and VAN ROOYEN N (2009) Environmental risk analysis for the NECSA proposed water and effluent infrastructure upgrade. *Softchem public access report*, No EIMSREP/2009/01/R4, June 2009, Johannesburg, South Africa.

FRIEND JFC, BORSHOFF J, PRETORIUS LE, MARSH D, SIEBERT T, SLABBERT J, VAN ROOYEN N, DU TOIT L, KVASNICKA J, SPEISER A, KINAHAN J, POTGIETER F, BUTCHER D and VAN RENSBURG J (2005) Langer Heinrich Uranium Mine environmental assessment final report. *Softchem report*, No LHUEA2005.01, April 2005, Johannesburg, South Africa.

FUGGLE RF and RABIE MA (1994) *Environmental management in South Africa*, Second Impression. Juta & Co., Ltd, Johannesburg, South Africa. ISBN 0-7021-2847-3.

JAIN RK, URBAN LV, STACEY GS and BALBACH HE (1993) *Environmental assessment*. McGraw-Hill, Inc, New York, United States of America. ISBN 0-07-032369-0.

LAKHANI M (2000) Call for comment on the draft submission to government on minimum public participation processes. *Earthlife Africa publication*, Johannesburg, September 2000.

SCHOGREN JF (1990) A primer on environmental risk analysis. *Staff report*, No 90-SR 46, December 1990, Center for Agricultural and Rural Development, Iowa State University, Ames, United States of America.