

## Engineering Compliance – East London Regional Waste Disposal Site – A Case Study

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### ABSTRACT

The East London Regional Waste Disposal Site, referred to as the Roundhill Landfill Site, has been in operation since February 2006. The site is classified and permitted as a G:L:B<sup>+</sup> site and currently accepts approximately 600 tonnes of general waste per day and restricted volumes of treated health care risk waste.

In recent years, the site has experienced significant operational challenges, resulting in increased health and safety risks and an increase in the adverse effects on the surrounding environment. As the operational challenges grew greater, the site progressed to a state of non-compliance. It was at this stage that *Envitech Solutions (Pty) Ltd* was appointed to compile a Turn-Around Strategy and an Implementation Plan, which would be in line and promote compliance with the landfill permit requirements and the prevailing environmental legislation.

This paper will explain the methodology adopted to ensure compliance within the shortest possible time and will detail the major engineering and social aspects encountered.

### 1. BACKGROUND

The Roundhill Landfill Site, located within the Buffalo City Metropolitan Municipality, near Berlin in the Eastern Cape, has been in operation since February 2006. The site is classified and permitted as a G:L:B<sup>+</sup> site, based on the previous landfill classification system, and currently accepts approximately 600 tonnes per day of general waste and restricted volumes of treated health care risk waste (excluding pathological waste of human origin) from East London, Mdantsane Township and the surrounding areas.

In the recent years, the site has experienced global operational challenges resulting in increased health and safety risks on the site and an increase in the adverse effects to the surrounding environment. As the operational challenges grew greater, the site progressed to a state of non-compliance. Upon receipt of various compliance notices and Directives from the Department of Environmental Affairs and the Department of Water and Sanitation and correspondence from the National Prosecution Services, Buffalo City Metropolitan Municipality, the Permit Holder of the site, acknowledged the need for specialist consulting services. *Envitech Solutions (Pty) Ltd* were thereafter appointed by Buffalo City Metropolitan Municipality, through their applicable procurement processes, to compile a Turn-Around Strategy and an Implementation Plan, which would be in line and promote compliance with the Landfill Permit requirements of the Roundhill landfill site and promote compliance with the prevailing environmental legislation.

The figures below detail the site and illustrates the previous major challenges and the state of non-compliances on the site, as may be experienced typically locally and internationally.



Figure 1: Aerial Photographs of the Roundhill Landfill Site



Figure 2: Uncovered Waste due to Shortages of Daily Cover Material



Figure 3: Steep Landfill Side Slopes due to Limited Lined Airspace



Figure 4: Uncontrolled Tipping of Waste outside the Lined Landfill Cell due to Inaccessibility to the Working Face due to Rainfall (No Wet Weather Cell Available)



Figure 5: Illegal Waste Pickers



Figure 6: Uncontrolled Stormwater, Contaminated Stormwater and Leachate Runoff

## 2. AIMS AND OBJECTIVES

The main objective of this Project was to present Buffalo City Metropolitan Municipality with a turn-around strategy for the **Roundhill Landfill Site** ensuring complete compliance. The turn-around strategy includes a Financial Forecast as well as an Implementation Plan with key deliverables and milestones for the proposed turn-around strategy.

In order to meet the objectives of the turn-around strategy, a status quo assessment and compliance assessment of the Roundhill landfill site was initially conducted. The initial status quo assessment and compliance assessment included, but was not limited to, an assessment on the day-to-day operations on the site, the current environmental monitoring, on-site record keeping, existing infrastructure, water management systems, leachate management systems, available plant on site and current staff resources. The objective of the status quo assessment and compliance assessment was to determine the level of compliance with the applicable Roundhill landfill site Permit issued by the Department of Water Affairs and Forestry and the Minimum Requirements for Waste Disposal by Landfill, Second Edition 1998, applicable to waste management facilities in South Africa.

## 3. SCOPE OF WORK

The scope of work to prepare a turn-around strategy was divided into three (3) phases by the Buffalo City Metropolitan Municipality. The scope of work included in these three (3) phases is as follows:

### 3.1 Phase 1 – Operational Assessment of the Site

- a) A waste stream analysis detailing volumes and waste types being landfilled on the site.
- b) Water Quality monitoring of the groundwater and surface water on the site and discharging from the site.
- c) Review and design of the cell development plan for current and future waste streams.
- d) Airspace and remaining life span calculations.
- e) Appointment and implementation of internal and external auditors.
- f) Setting up of a Monitoring Committee.
- g) Assessment of the integrity of the existing infrastructure on site including the following:
  - Landfill cells
  - Fencing
  - Landfill liners
  - Leachate management system
  - Stormwater management system
  - Ground water and surface water monitoring network
  - Landfill gas monitoring system
  - Weighbridges
  - Machinery and equipment
  - Transfer station with means to facilitate further waste separation
- h) Assessment of operational requirements.
- i) Assessment of the requirements for a laboratory on site.
- j) Assessment of human resources and skills to meet the operational requirements of the site.
- k) Address the issue of job creation for the existing informal recyclers operating on the site.
- l) Address the value chain of the waste management hierarchy with specific emphasis on recycling and reduction of waste to landfill.
- m) Financial Forecast for implementing the turn-around strategy.
- n) Preparation of an Implementation Plan.
- o) Presentation of the turn-around strategy.

### 3.2 Phase 2 – Implementation of the Rehabilitation Plan

Based on the outcomes of Phase 1, the implementation plan for the rehabilitation of the Roundhill landfill site was to be carried out under Phase 2. The implementation plan was to include for the preparation of Tender Documents for all works required to bring the Roundhill landfill site back into compliance. The proposed works included the following:

- The shaping and rehabilitation of the landfill side slopes.
- Removal of litter and waste from outside the footprint of the existing landfill cells.
- Appointment of service providers to ensure good aesthetics of the site.
- Repairs and upgrade to the stormwater management system.
- Repairs and upgrade to the leachate management system.
- Repairs to the cell liner systems
- Upgrades of the site access roads.
- Repairs to the existing fence and surveillance to ensure security of the site.
- Installation of appropriate signage.

### 3.3 Phase 3 – Design, Construction and Management of Cells 3 and 4

Phase 3 includes for the design, construction and management of two (2) new landfill cells at the Roundhill landfill site. It was anticipated that Phase 3 activities was to be undertaken parallel to Phase 2 activities.

## 4. METHODOLOGY

In order to comply with the scope of work, draft the status quo report, the financial forecast and the implementation plan that informs the turn-around strategy, the following methodology was followed:

- A site visit, inspection and assessment of the Roundhill landfill site was undertaken by three technical staff members of Envitech Solutions (Pty) Ltd.
- Various interviews, with key personnel and key role players responsible and related to the Site, were conducted during the above mentioned site visit.
- The collection and gathering of available information from previous external service providers located within East London.
- The collection and gathering of available water quality monitoring results from Buffalo City Metropolitan Municipality Scientific Services.
- Assessment and analyses of the current operations and conditions on site against the Site Permit, the amended Site Permit, and the Minimum Requirements for Waste Disposal by Landfill in an audit format.
- Initiation and topographical survey of the entire Roundhill landfill site.
- Initiation and conducting of environmental monitoring, which includes ground water, surface water and air quality monitoring.
- Conducting a geotechnical investigation to confirm available geotechnical information.
- Attendance of monitoring committee meetings to meet Interested and Affected Parties and key role players.
- Compilation of a Status Quo and Compliance Assessment.
- Detailed analysis of information to compile a Financial Forecast, Implementation Plan and the Turn-Around Strategy Report.

## 5. TURN-AROUND STRATEGY HIGHLIGHTING OBJECTIVES TO ENSURE COMPLIANCE

To bring the site back into compliance within the shortest time possible, various alternatives were assessed and immediate to short term, medium term and long term objectives were formulated. In order to ensure compliance, the objectives and phases would need to be concurrent and integrated.

### 5.1 Immediate to Short Term Objectives

The immediate to short term objectives are detailed in **Table 1**.

Table 1: Immediate to Short Term Objectives to Ensure Compliance

	Implementation	Scope of Works	
<p style="writing-mode: vertical-rl; transform: rotate(180deg);"><b>Immediate to Short Term Objectives to Ensure Compliance</b></p>	<p><b>EMERGENCY CONTRACT</b></p> <p>Establish an experienced Contractor on site that can execute both landfill operations and civil works.</p>	<p><b>Landfill Operations</b></p> <ul style="list-style-type: none"> <li>To run all site operations from the site entrance (including acceptance control) through to landfilling operations for a period of at least 24 months.</li> <li>Upgrade, implement, manage and maintain the weighbridge function including data capture.</li> <li>Clean-up and maintenance of entrance road and all site access roads.</li> <li>Site maintenance which includes the clean-up of the entire site to remove scattered wastes and windblown wastes.</li> <li>Garden services to commence with landscaping and maintenance and removal of alien vegetation.</li> <li>Implement and maintain required signage at the site.</li> <li>The implementation of a control system for the waste pickers that are currently on site in order to minimise the risks in terms of health and safety.</li> <li>Implement and maintain monthly production surveys.</li> <li>Develop and maintain a monthly landfill report.</li> <li>The contractor appointed under this emergency contract will be required to work with the current staff complement on site. They may however be required to make the necessary changes to the site plant and equipment in order to carry out the above works.</li> <li>Implement and maintain Quarterly Internal Audits.</li> <li>Implement and maintain a Health and Safety Structure as required by the OHS Act.</li> <li>Manage the weather station including the downloading, processing, analysing and storing of data retrieved.</li> <li>Skills transfer and training to current staff complement.</li> <li>Implement and maintain access control.</li> </ul>	
		<p><b>Civil Works</b></p> <ul style="list-style-type: none"> <li>Construction of a temporary landfill cell in the proposed Cell 3 area to accommodate the incoming waste stream and waste excavated / removed from the existing cells 1 and 2.</li> <li>Shaping of existing waste body (cells 1 and 2) and demarcation of a working platform area (using soil berms) to ensure safety of personnel and machines working on the higher level of the landfill.</li> <li>Commencement of rehabilitating the landfill slopes on the existing waste body and partial capping of existing landfill Cell 1 and Cell 2.</li> <li>Upgrade and maintenance of all stormwater and leachate management systems.</li> <li>The implementation of an interim leachate management system including the pumping of leachate from various ponds and from the current leachate storage tanks for removal from site to a waste water treatment plant. The removal of leachate from the leachate tank area will facilitate the proper investigation of suspected leaks from the existing leachate tank.</li> <li>The installation of new groundwater monitoring boreholes.</li> <li>Expose the liner of Cell 1 and Cell 2, where possible, and repair where needed.</li> <li>The upgrading and repairing of the boundary fence and security system on the site to prevent unauthorised entry, including the clearing of the fence line.</li> <li>Rehabilitate the temporary landfill area.</li> <li>Implement a perimeter access road along the perimeter fence.</li> <li>Repair and clean stormwater drains around the existing infrastructure (buildings).</li> </ul>	
		<p><b>Monitoring Committee</b></p>	Revive and structure the monitoring committee appropriately.
		<p><b>Implement an excavation plan</b></p>	Excavate, where possible, the future landfill cell/s for cover material.
		<p><b>Import cover material</b></p>	To assist with day to day operations for covering of the waste.

In order to achieve the immediate to short term objectives, it was recommended that an Emergency Contract be implemented as soon as possible. The Emergency Contract is currently being implemented on site and is detailed under *Project Status*.

## 5.2 Medium Term Objectives

The medium term objectives are detailed in **Table 2**.

Table 2: Medium Term Objectives to Ensure Compliance

	Implementation	Scope of Works
<b>Medium Term Objectives to Ensure Compliance</b>	<b>CIVIL WORKS</b>	Construction of new landfill Cells 3 and 4. It was proposed to construct Cell 4 first and the construction will be phased, such that when the first half of the cell is completed, landfilling can then commence in the completed portion whilst the construction is on-going. Upon completion of Cell 4, the remaining waste in the temporary cell will be removed and placed in the new Cell 4. Thereafter construction of Cell 3 will commence.
		Most of the above work will need to take place simultaneously, i.e. landfilling, rehabilitation and construction work and will be phased concurrently in the implementation plan. For this reason it was recommended that the Contractors appointed liaise closely and programme their works accordingly.
		The rectification and implementation of separation, diversion, collection and storage of stormwater runoff, both on site and off site, where applicable.
		The rectification and implementation of a suitable leachate management system, by means of a leachate treatment plant.
		Erection of a Materials Recovery Facility.
		Future repair and maintenance of the perimeter fence.
		Rehabilitation of any other contaminated land on site.
	<b>Monitoring</b>	Revive and re-structure the environmental monitoring plan.
		Implement and maintain bi-annual external audits.
		Implement and maintain a landfill gas monitoring plan.
	<b>Establish an experienced security company on site</b>	Implement and maintain strict access control.
	<b>Monitoring Committee</b>	Revive and structure the monitoring committee appropriately.
	<b>Community liaison</b>	Formalise the reclaimers.
		Establish support to a materials recovery facility, preventing reclamation at the working face due to the health and safety risks.
	<b>Accounts / Disposal tariffs</b>	Implementation of updated disposal tariffs.
Collection of accounts.		

In order to achieve the medium term objectives, it was recommended that a single Contract be implemented as soon as the implementation of the immediate to short term objectives commenced.

The Engineering Design and Bid Document for the medium term objectives are currently being finalised and implementation thereof is anticipated to commence later this year.

### 5.3 Long Term Objectives

The long term objectives are detailed in **Table 3**.

Table 3: Long Term Objectives to Maintain Compliance

	Implementation	Scope of Works
Long Term Objectives to Maintain Compliance	<b>CIVIL WORKS</b>	The planning and construction of future landfill Cell 5 and Cell 6.
		The on-going rehabilitation and capping of existing landfill cells.
		The construction of new and upgrades to the existing stormwater management systems.
		The upgrades and maintenance of the leachate management system and leachate treatment plant.
		Maintenance of the Materials Recovery Facility.
		Continuous rehabilitation of any other contaminated land on site.
	<b>Monitoring</b>	Maintain the environmental monitoring plan.
		Maintain the bi-annual external audits.
		Maintain the landfill gas monitoring plan.
	<b>Establish an experienced security company on site</b>	Maintain access control.
		Future repair and maintenance of the perimeter fence.
	<b>Monitoring Committee</b>	Maintain the landfill monitoring committee.
	<b>Community liaison</b>	Communicate with the reclaimers.
	<b>Accounts/Disposal tariffs</b>	Review of disposal tariffs.
Collection of accounts.		

In order to achieve the long term objectives, it was recommended that various Contracts be implemented timeously, ensuring that the existing landfill cells are operated efficiently, continuous rehabilitation of the existing cells occur and regular maintenance of all site facilities be implemented.

### 6. PROJECT STATUS

After review and acceptance of the turn-around strategy report by Buffalo City Metropolitan Municipality, an Emergency Contract for the *Emergency Operations and Management of the East London Regional Waste Disposal Site for a Period of Twenty Four Months* was implemented.

Interwaste (Pty) Ltd is the appointed landfill operations and civil works Contractor for the Emergency Contract. The Contract Commencement Date was 1 June 2015 with the operational works well into its sixteenth month with the civil works having being completed in June 2016.

The figures below highlight the major works undertaken during the Emergency Contract.





Figure 7: Repairs and Upgrades to the Weighbridge System



Figure 8: Construction of Temporary Cell 3



Figure 9: Partial rehabilitation of Cell 1 and 2: waste shaping, berm construction and capping works  
As can be expected with a Contract of this magnitude, a few of the major challenges experienced to date include community issues, employment of local labour, management of the illegal waste pickers, Buffalo City Metropolitan Municipality and Interwaste staff integration, the availability of historic site information and the fires experienced on site.

A few of the major successes, completed to date, include the following:

- Accelerated mobilisation of Interwaste staff and plant to commence with the landfill operations and civil works.
- Extensive clean-up of the site, including the access roads, transfer station area, site facilities and existing stormwater provisions.
- Investigative confirmation of the existing leachate management facilities and the upgrade thereof.
- Excavations by hand to locate existing site services and landfill liner edges.
- Repairs and upgrades to the weighbridge system to ensure accurate waste information.
- The construction of a HDPE lined temporary landfill cell.
- The partial rehabilitation of existing landfill cell 1 and cell 2.
- Upgrades and construction of improved staff facilities.
- Appointment of a Social Facilitator and a Community Liaison Officer.
- Registration of waste pickers.
- Water and air quality monitoring.
- Internal and external site audits.
- Re-establishment of the landfill monitoring committee.
- Services Seta and Interwaste 12 month Learnership.
- Department of Environmental Affairs site visits, inspections and on-going communication.
- Department of Water and Sanitation site visits, inspections and on-going communication.
- Mayoral and City Manager Site Visits.

## 7. THE TRANSFORMATION...



Figure 10: Cell 1 and Cell 2 - The western slope



Figure 11: Cell 1 and Cell 2 - The eastern slope



Figure 12: Before and After – October 2015 – May 2016

## 8. CONCLUSION

With the operational works under the Emergency Contract progressing well and the civil works complete, Envitech Solutions are currently finalising the Engineering Design and Bid Document for the medium term objectives which will ensure continued compliance of the Roundhill landfill site and timeous implementation of the turn-around strategy. The medium term objectives for the next contract includes the construction of two new Class B landfill cells, a full scale leachate treatment plant and various ancillary works.