



The drawing represents the level difference between survey "14562N003.dwg" (carried out by R.Cantelli Surveys Ltd and provided by Wastes & Maths Ltd) and drawing D117657772N003-Top of Pre-Settled Waste, designed by Scott Wilson Ltd.

## Areas of Fill

Areas of Cut

Level Difference
+1.03, -0.78

Order Status	Order Date	Order Time	Order Type	Order ID
Order Status	Order Date	Order Time	Order Type	Order ID

AREAS OF  
CUT AND FILL

Scale read	
15500	
Drawn	Approved BCG
PV	
Stage 1 check FV/BCG	Stage 2 check C/B/field
	Date 30/3/2009

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**WILSON**

## **Clarifications on Annex 3 submitted to MEPA in May 2011**

### **General queries**

- 1. Please confirm whether WasteServ is proposing to consider the landfill as definitely closed, to enable MEPA to carry out an assessment as per Regulation 16 of L.N. 168 of 2002.**

The facility shall be considered closed following infilling of available space.

- 2. Please provide a full closure plan (not a summary). The closure plan should also include details regarding aftercare of the site.**

The closure plan is specified by means of two documents, namely (1) Ta' Zwejra Landfill – Closure Plan – Gas Collection System – Specification and Construction and Quality Assurance Plan and (2) Ta' Zwejra Landfill - Closure Plan – Intermediate Capping - Specification and Construction and Quality Assurance Plan. These are attached as Appendices 2 and 3 respectively.

- 3. Provide draft timeframes for commencement and conclusion of this plan.**

This plan shall be concluded by the end of 2012.

- 4. The closure plan is to include a plan with details regarding how each of the requirements of Annex III of Directive 1999/31/EC (Schedule 3 of LN 168 of 2002) will be met.**

WasteServ has commissioned Messers Adi Associates to compile a review of the monitoring requirements in the current IPPC permit for Ta' Zwejra and to propose a monitoring plan for the facility. This proposed draft monitoring plan is included as Appendix 1 for consideration by the IPPC committee. The proposed monitoring arrangements shall be implemented during the operational phase as well as the aftercare phase.

- 5. Please also identify the works supervisor, indicate whether this person is a WasteServ employee and supply a CV.**

The gas extraction works shall be supervised by Ing Nicholas Vella whilst the earthworks shall be supervised by Mr Charles Zerafa both under the supervision of the Chief Operations Officer. CV for Ing Nicholas Vella is provided in Appendix 4.

- 6. How will collection and treatment of leachate be carried out? What is the fate of wastes arising from leachate treatment?**

Leachate shall be re-circulated within the site itself.

- 7. Please indicate whether any material is proposed to be extracted (refer to plan D117657/TZ/M04), and if so, give details regarding the material expected to be extracted, indicating proposed use or disposal.**

Material from 'cut' operations shall be used for 'fill' operations in the areas indicated in the drawing.

### **Capping**

- 8. The closure plan is to include details regarding the final capping system, not only the intermediate capping system.**

Intermediate capping is generally achieved through installation of a low to medium permeability cover e.g. polyethylene lining. In this case the lining system shall be as specified in the closure plan submitted. This shall be considered as the final cap.

- 9. Please give areas, volumes and technical specifications of fill and soil (in accordance with plan D117657/TZ/M/04).**

The foreseen 'cut' and 'fill' volumes are as follows:

Cut (Blue shading in drawing D117657\_TZ\_M\_04): 55,432 m<sup>3</sup>

Fill (Yellow shading in drawing D117657\_TZ\_M\_04): 84,120 m<sup>3</sup>

- 10. Please indicate the projected volume of crushed limestone required for the 350 mm layer of crushed limestone, whether there is a need for procurement of additional external limestone/mineral sources, and sources of procurement. Please note that all processes connected with further mineral extraction and landfilling/landscaping should be regularly monitored and recorded. Use of local clay sources should seek prior authorisation from MEPA and MRA.**

Approximately 14,500 m<sup>3</sup> of crushed limestone are required. These shall be sourced from within the Maghtab Complex itself i.e. from material generated through the excavation of the Ghallis landfill.

- 11. How will the site be capped to ensure minimal infiltration of precipitation? What material will be used for capping? Please give details regarding areas and volumes of capping material, as well as technical specifications.**

Details are provided in sections 5 and 6 of document Ta' Zvejra Landfill - Closure Plan – Intermediate Capping - Specification and Construction and Quality Assurance Plan (Appendix 3).

- 12. How will wind and precipitation erosion of capping material be avoided? The need to install a drainage system for surface erosion prevention should be considered.**

Details are provided in section 7 of document Ta' Zvejra Landfill – Closure Plan – Intermediate Capping - Specification and Construction and Quality Assurance Plan (Appendix 3).

- 13. What construction quality assurance measures will be undertaken to ensure the integrity of the intermediate and final capping systems? These are to be provided as part of this application and prior to start of the works.**

Details are provided in document Ta' Zvejra Landfill - Closure Plan – Intermediate Capping - Specification and Construction and Quality Assurance Plan (Appendix 3).

- 14. Re-vegetation of the site: An assessment should be provided of top soil and any other requirements in relation to various types of vegetation proposed (especially in view of the required depth of root systems, to ensure that roots do not penetrate the capping systems).**

**In addition, given the reference in the closure plan to grass, it is important that use of vegetation is in agreement with what will be approved in the corresponding PA application. Moreover, WasteServ must ensure that no invasive species are made use of, which may disrupt the natural habitats found around the site. The use of trees and shrub species already present in the adjacent land areas should also be considered for any landscaping as per the approved landscaping scheme.**

The same methodology as that approved in PA 06149/08 Proposed rehabilitation of the former Maghtab Landfill shall be utilised.

**15. Monitoring for the capping system is to be included with the current monitoring programme of Ta' Zwejra. In addition, control and trigger levels are to be proposed.**

WasteServ has commissioned Messers Adi Associates to compile a review of the monitoring requirements in the current IPPC permit for Ta' Zwejra and to propose a monitoring plan for the facility. This proposed draft monitoring plan is included as Appendix 1 for consideration by the IPPC committee.

**Gas management**

**16. Further details regarding “knock-out-pots” are expected. Also, further details regarding the existing gas treatment facility should be included with this document.**

Reference is being made to the document entitled document Ta' Zwejra Landfill - Closure Plan – Intermediate Capping - Specification and Construction and Quality Assurance Plan (Appendix 3), Section 5.3 “Condensate Draining Leg Installation” for construction details of the condensate ‘knock-out-pots’. The function of these fixtures is to re-circulate any humidity extracted from the Landfill gas, back into the landfill in a liquid state (condensate). This ensures an improved efficiency in the collection and treatment of the gasses.

**17. Gas management: The following issues should be considered:**

***a. Measures to be taken in order to control the accumulation and migration of landfill gas.***

Monthly monitoring of each and every gas well is being scheduled. Furthermore, off-site monitoring is included in the monitoring schedule to shall mitigate the possibility of any migration.

***b. Possible installation of a dedicated gas drainage layer as part of the capping system.***

The number of gas wells should suffice to ensure capturing of the bulk of gases generated. Should monitoring confirm presence of an elevated gas activity, the system as designed shall permit further installation of gas wells.

***c. Assessment of the short- and long-term risks of deep-seated fires and identification of ways to mitigate these risks, considering different plans for future use of the landfill area.***

In most circumstances, sub-surface fires result in elevated carbon monoxide emissions within the landfill gas (to the detriment of methane). The monthly monitoring/field balancing activities planned as part of the routine maintenance of the Ta' Zwejra gas collection system shall be an effective means to signal the

presence of sub-surface fires. There exist a number of practical measures to control such fires, mainly (but not limited to) the re-circulation of leachate within the affected area.

***d. Further details regarding gas treatment, including proposals for monitoring as specified in Schedule 3 of L.N. 168 of 2002 (Landfill Regulations).***

The Ta' Zwejra gas collection system shall initially be connected to the gas treatment system used for the treatment of gases from the nearby Maghtab Dump. Prior to the installation of a CHP, this gas shall be treated in dedicated (separate from the Maghtab gas collection system) flares. Besides the Regenerative Thermal Oxidiser (RTO) which is dedicated to treat landfill gas originating specifically from the former Maghtab landfill, the gas compound is also equipped with two biogas flares. The smaller high temperature flare is an HT1.0 (with a firing capacity of 1MW) whilst the larger unit is an HT5.0 (with a firing capacity of 4MW). These flares are designed to operate with a calorific value of 4kWh/m<sup>3</sup> and their range will ensure the complete combustion of any quantity of landfill gas originating from the engineered landfills including Ta' Zwejra. Further details on the flares may be found in Appendix 5.

***e. Further details, including timeframes, for utilisation of landfill gases for energy production.***

This plan including utilisation of landfill gas shall be concluded by the end of 2012.

## **Post-closure requirements**

**18. The closure plan should also include details regarding how the site will be inspected by the operator (and how frequently) during and after closure, and how any infrastructure will be maintained post-closure.**

The site shall be subjected to routine environmental monitoring tests as provided in the plan and in accordance with the IPPC permit. These tests are designed so as to flag any damage to the capping/collection structure, which would in turn trigger appropriate remedial action. Furthermore, the gas field shall be subjected to a monthly gas well monitoring/balancing operation. The scope of such activities is not only to ensure an efficient capture of landfill gas but also to guarantee the correct operation of any eventual renewable energy generation source.

**19. Once the settlement of the landfill is completed, are there plans for removal of redundant facilities (e.g. leachate wells, landfill gas treatment)?**

It is being estimated that post-closure activities within the landfill may persist anywhere between 15 and 25 years. There are no immediate plans, nor is it being foreseen that any such equipment will become redundant.

**20. Once the settlement of the landfill is completed, what are the plans for further use of the site, and how will the safety of the site be ensured? In case of planned public use of rehabilitated areas, a risk assessment, including a Health Impact Assessment, needs to be performed.**

Noted. The future use of the site shall be in line with other plans for use of other areas of the Maghtab Complex.

## Clarifications on Closure Plan submitted to MEPA in May 2012

	IPPC Committee Feedback	WSM Feedback
<b>Closure plan</b>	<p><i>Appendix 2: Closure plan (Gas collection system)</i></p> <ol style="list-style-type: none"> <li>1. A plan showing how landfill gas will be treated and used for electricity production is required.</li> <li>2. A dedicated gas drainage layer is required as per Annex I of Directive 1999/31/EC.</li> <li>3. Provide an account of any gas collection to date and any gas composition analysis available to date, to enable an assessment of which phase the landfill is in.</li> </ol> <p><i>Appendix 3: Closure plan (Intermediate capping works)</i></p> <ol style="list-style-type: none"> <li>1. This submission is not a final closure plan. A final closure plan is required.</li> <li>2. The design of surface sealing should follow that provided by the German ‘<i>Deponieverordnung</i>’ of 2002. A standard surface sealing system should consist of (from top to bottom): top soil cover (d &gt; 1.0 m) geotextile; drainage layer (d &gt; 0.3 m; k &gt; <math>1 \times 10^{-3}</math> m/s); protection layer (geomembrane; d &gt; 2.5 mm); mineral sealing layer (d &gt; 0.5 m; k &lt; <math>5 \times 10^{-9}</math> m/s); artificial sealing liner (geomembrane; d &gt; 2.5 mm) or 0.6 m compacted soil. Please provide plans for final capping in line with the above requirements.</li> <li>3. Appendix B – Material Specification of Bentofix not submitted.</li> </ol>	<p>Appendix 2: Closure plan (Gas collection system)</p> <ol style="list-style-type: none"> <li>1. The gas extraction system leading is being designed to operate on gases emanating from both operational engineered landfills (i.e. blending of gases from Zwejra and Ghallis). The reason behind this blending option is to optimize the gas intake within the generation unit, so as to eliminate the requirement for pre-treatment systems. As a practical example, gases from Ghallis may augment the methane content in the feed since the gas from Zwejra may have a lower methane content. Similarly, blending of gases may lower the H<sub>2</sub>S content of the feed when concentrations are higher. A number of trials are still required to identify the optimum mixture. It may be pertinent to note that the gas extraction system shall be capable of diverting any extra gas (in excess of the CHP capacity) to any one of our 2 flares to ensure a holistic treatment of emissions within the Maghtab Complex. Furthermore gases from the different facilities may be segregated as and when required.</li> <li>2. Noted.</li> <li>3. Requested information is included in Appendix 1 to this submission.</li> </ol> <p>Appendix 3: Closure plan (Intermediate capping works)</p> <ol style="list-style-type: none"> <li>1. WasteServ has sought the advice of the consultants who prepared the closure plan as to compliance of the proposed surface sealing system with the German ‘<i>Deponieverordnung</i>’ of 2002. Feedback on this issue shall be provided as soon as possible.</li> <li>2. WasteServ has sought the advice of the consultants who prepared the closure plan as to compliance of the proposed surface sealing system with the German ‘<i>Deponieverordnung</i>’ of 2002. Feedback on this issue shall be provided as soon as possible.</li> <li>3. Typical specifications include as Appendix 2 to this submission.</li> </ol>



<b>Aftercare of site</b>	<p><i>A detailed proposal on the maintenance, monitoring and control in the aftercare phase of the site needs to be submitted.</i></p> <p><i>Monitoring frequencies should be compliant with Annex III of Directive 1999/31/EC (Schedule 3 of LN 168 of 2002).</i></p>	<p>The aftercare of the site has not been determined as yet. A number of uses are currently being considered including use of the site for the cultivation of biomass crops; alternatively the same rehabilitation method as that for the former Magtab dump (PA 06149/08) may be utilised. WasteServ would in fact like to initiate discussions as to acceptable uses.</p> <p>Comment regarding monitoring frequencies has been noted.</p>
<b>Status of infilling</b>	<ol style="list-style-type: none"> <li><i>1. Post-settlement profile not submitted. Kindly submit.</i></li> <li><i>2. The June 2011 submission indicates that 28,668 m3 are still available for infilling. Please provide an update to the status of infilling.</i></li> <li><i>3. Please indicate the total proposed volume of the landfill.</i></li> </ol>	<ol style="list-style-type: none"> <li><i>1. To be provided by 15 June 2012 together with the revised closure plan.</i></li> <li><i>2. Circa 22,000 cubic metres of void are still available.</i></li> </ol>
<b>Leachate collection and treatment</b>	<p><i>WasteServ is to submit a proposal for collection and treatment of leachate off-site or on-site, as required by Annex I of Directive 1999/31/EC, both during operation and following closure.</i></p>	<p>The current plan involves treatment via reverse osmosis.</p>