



Construction Method Statement

**Alteration to the internal lateral landfill profile to extend the
Ghallis landfill capacity**

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Organization & Responsibilities

Client

Wasteserv Malta Ltd

Eko Centre

Triq il-Latmija,

Marsascala

Contractor

Frisoli s.r.l.

Corso Garibaldi, 92

71121 Foggia

Italy

Contact Person:

Principal / Senior Project Manager

Ing. Daniele Cocca

Mobile: +39 3293224267

Email: ing.danielecocca@gmail.com

1. Introduction

The purpose of this document is to give explanation on the methodology regarding the construction of the foundation and the alteration to the internal lateral landfill profile to extend the Ghallis landfill capacity.

This report is being prepared as part of the PA/01586/18 to amend Permit PA 964/11 and alter the internal lateral landfill profile to increase volume capacity of Ghallis non-hazardous landfill. It includes the construction methodology of the intervention, from preparation of the works to the construction of the patented retaining structures.

Ghallis non-hazardous landfill was designed as a disposal facility that implements the requirements of Directive 1999/31/EC on the landfill of waste as transposed by Legal Notice 168 of 2002 Waste Management (Landfill) Regulations. The landfill facility was originally approved for development by PA 04834/04 after an Environmental Impact Assessment process. Several development permits on site were required to allow various modifications and upgrades as part of a Master Plan for the Maghtab Environmental Complex, which was assessed via an update to the original EIS (GF 00121/06). The operations of this facility were originally permitted on the 6th April 2007 through the issue of the integrated pollution prevention and control permit IP001/06/A; this permit's renewal was decided on 31st January 2013 through the issue of IP001/06/B.

The construction of the landfill proceeded in phases consisting of independent cells, and certified via Construction Quality Assurance reports that were prepared during the construction of each cell. The engineering specifications were derived from the results of hydrogeological, landfill gas and stability risk assessments, to ensure that operations at the installation would not result in an adverse effect on the surrounding environment. Each cell has its own leachate collection/extraction system, as well as a gas extraction system connected to a central gas management facility. At the moment, the construction of the final cell is currently being completed, and the gas extraction system that was the subject of the IPPC permit renewal in 2013 is being implemented.

2.0 Operations & Activities

2.1 Project description

These engineering works would extend the Ghallis landfill lifetime by increasing void space by circa 315,000 ton.

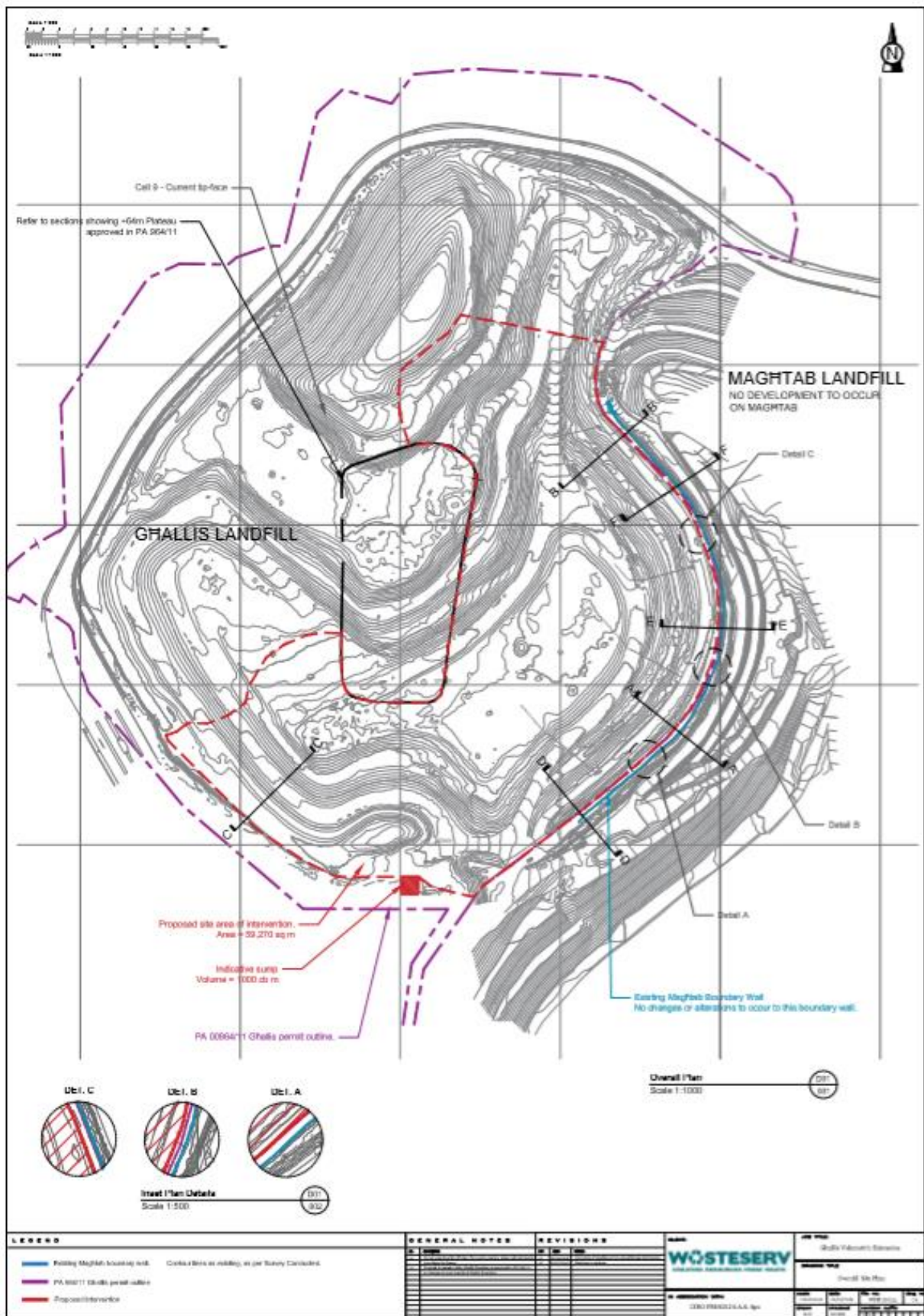
The proposal model for increasing volume capacity of Ghallis landfill consists of:

- A side-slope lining system constituted of (from bottom to up) a geological barrier, geocomposite bentonite layer (GCL), HDPE geomembrane sheet, a nonwoven geotextile and a fine protection layer;
- A “foundation” constituted of a layer of mixed stabilized material wrapped with a woven geocomposite overlying a layer of gravel;
- A Retaining structure (Side-Cap) with an angle of 70° constructed according to the “Refuse dump containment structure®” of Frisoli EP 1661635 A1 (European patent).

The structure will be constructed around the perimeter of the proposed area of intervention for 667m with a width of 15 m: a total area of approximately 10,000 m² in total.

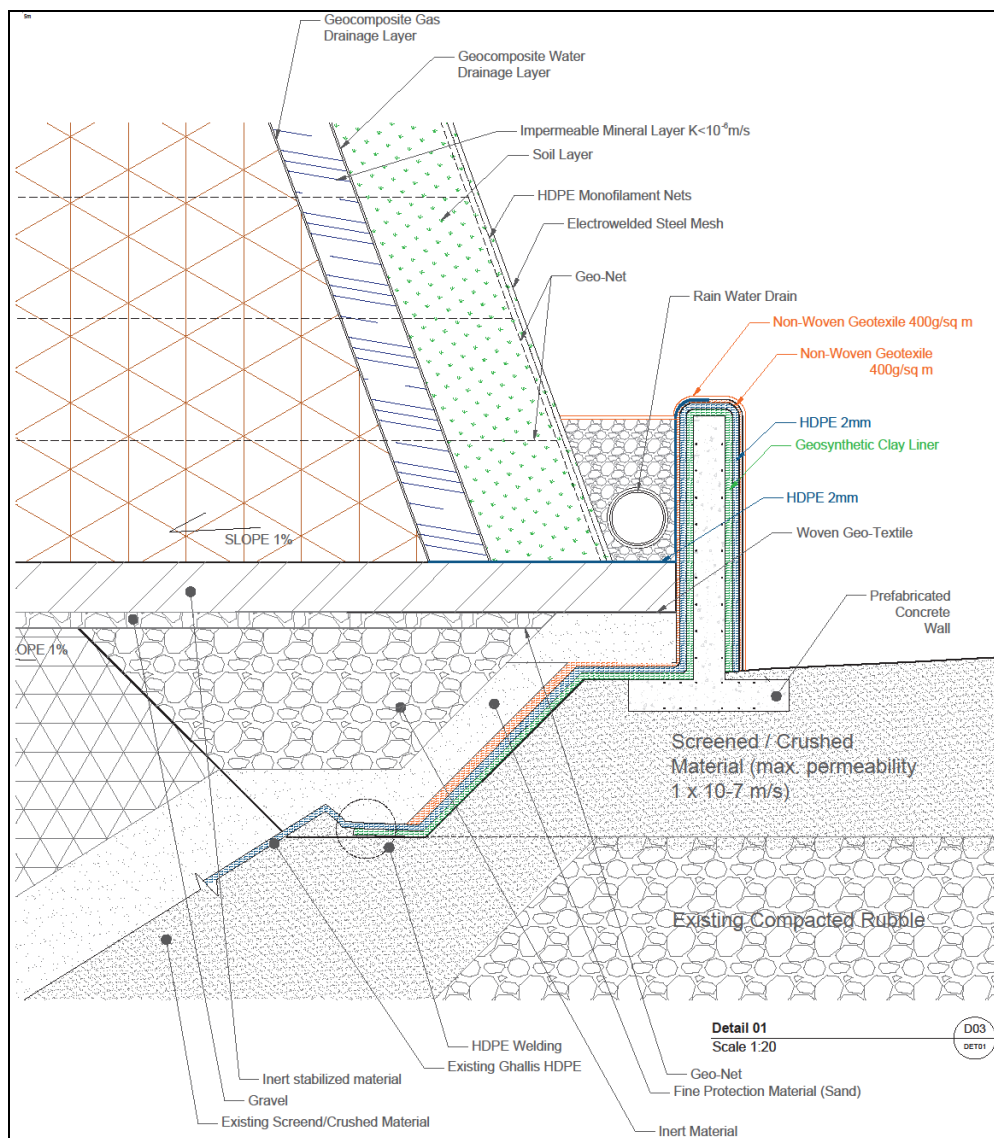
The landfill area where this project is proposed is located along the eastern and south side of the Ghallis landfill, which faces the western aspect of the Maghtab landfill. Plan 1 illustrates the site boundary of the Ghallis non-hazardous landfill, as permitted via development permit PA 00964/11. The boundary of the Maghtab landfill is immediately adjacent to the Ghallis landfill boundary; the interventions proposed by this project, including the laying of foundations, will not involve any interventions on the Maghtab landfill as indicated in the detail of Plan 1.

It is considered appropriate to realize a perimeter access road of 3 meters large to separate the proposed line of intervention from Maghtab landfill’s boundary.

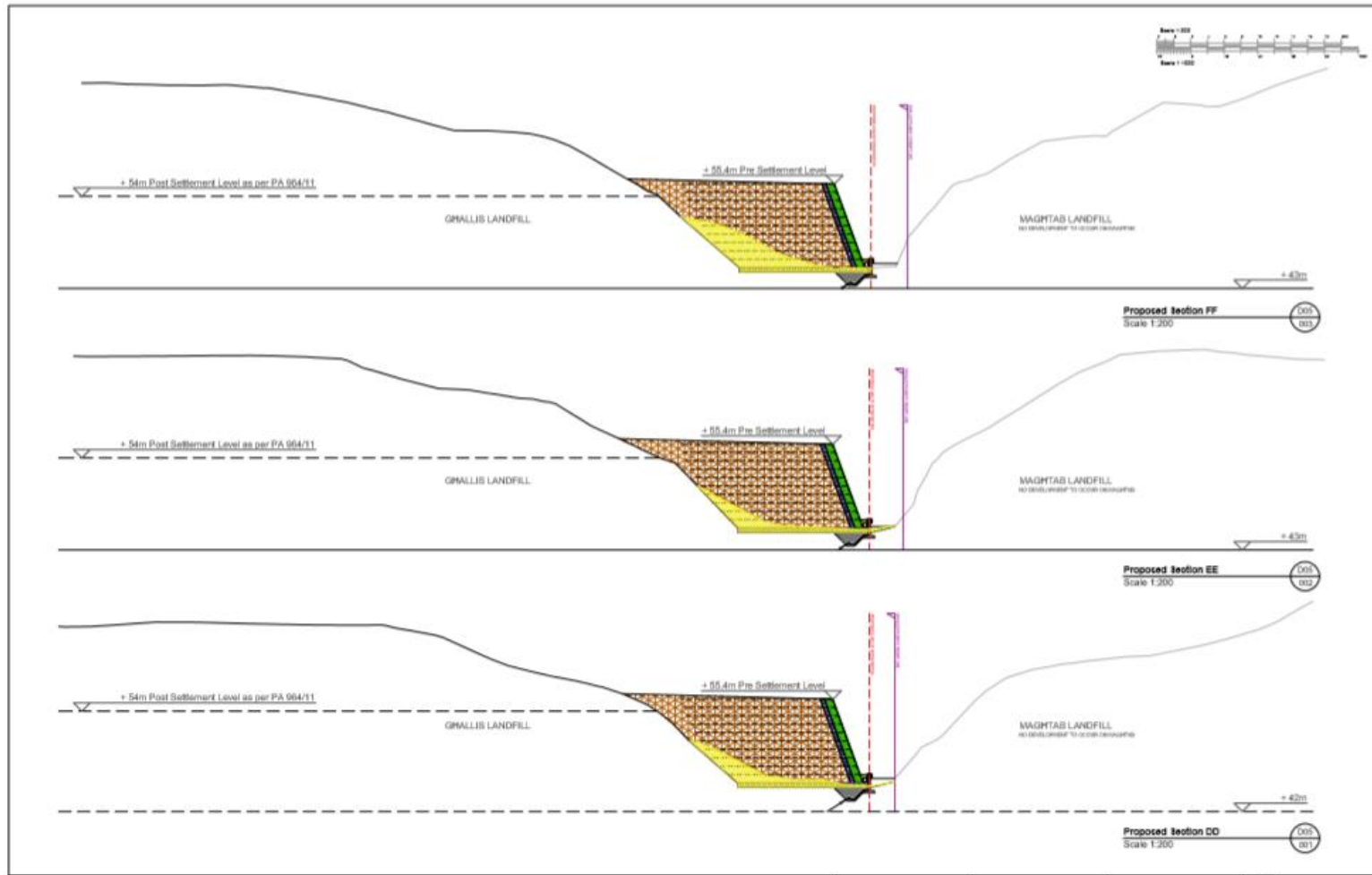


Plan 1: Proposed intervention area

Plan 2 is a design highlighting the features forming part of the retaining wall structure. The typical cross-sections of the proposal superimposed on the Ghallis landfill are provided in Plan 3, which allows comparison of the existing landfill profile with that which is being proposed. The boundaries of the Ghallis and Maghtab landfills are illustrated, though the distance between them is expected to vary as per Plan 1. Since the altitude of the basis of the proposed retaining structures along the area of intervention is variable, the height of the structures will have a max. height of 15 m, when it is possible, ensuring that the post-settlement height is in line with the approved post-settlement height (54m) of Ghallis landfill. No increase in height beyond the permitted limits is being contemplated. The total waste fill capacity gained as a result of the re-engineering would be approximately 315,000 ton.



Plan 2: Technical details of the proposed retaining structure for waste



Plan 3 : Typical sections through the Maghtab and Ghallis landfills, illustrating the manner in which the conceptual design in Plan 2 is superimposed on the existing profile of the Ghallis landfill.

Access will be serviced by internal roads currently available within the Maghtab complex. The project may involve the creation of additional access routes traversing the waste mass itself, as is currently required by logistic requirements of the waste deposition process.

2.2 Field inspection and preconstruction review

The site conditions will be reviewed once the works start to determine if there will be any additional construction procedures required for preparation of the foundations, site accessibility, excavation, and construction not provided into design and project prescription.

The field personnel will review the method and design with respect to safety and the influence of its performance on other landfill works in Ghallis landfill, which albeit does not interfere with each other.

Preparation of site area will be realized with respect to the project design and Project leader indications. Health & Safety manager will collaborate to organize the site area with respect to the health & safety prescriptions.

2.3 Materials inspections

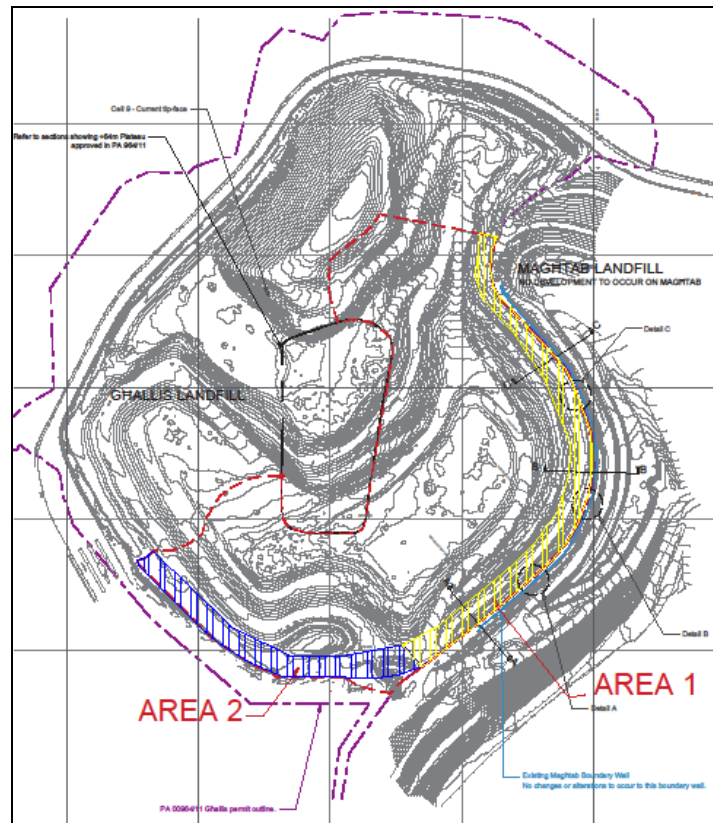
Material components will be examined on site. Material acceptance will be based on a combination of certification ascertainment and visual observations. When delivered to the project site, the inspector will carefully inspect all material. On site, all system components will be satisfactorily stored and handled to avoid damage. The inspector will assure the materials are being fabricated in accordance with the agency's standard specifications.

The personnel who are currently in acceptance will report all materials that show non-compliance during the approval phase. Non-compliant products will be segregated in specific areas of the site, to ensure their non-use in the phases of completion of the processing activities.

2.4 Site preparation

Prior to the commencement of foundation works, areas on which foundation and structure are to be placed will be cleared, grubbed and scalped as required in order to create a horizontal plan suitable for the building of the foundation and the overlying containment structures.

Since there is a significant slope in the existent foundation profile, a longitudinal steps solution will be necessary to make uniformity and continuity to the structure. The new cell foundation area will be constructed using on-site fill and will be sloped at a grade of approximately 1% to both Area 1 (from south to north) and Area 2 (from east to west).



Plan 4: Area 1 and Area 2

2.5 Materials handling and storage

The contractor's site area will provide the storage area for all equipment and materials delivered to site.

Site storage involves the provision of adequate space, protection and control for materials, components and equipment.

The Contractor will be responsible for all the materials storage and handling related to the proposed project, of checking the quality and quantity of materials on delivery, monitoring stock holdings, and guarantee the necessary protection for durable and non-durable materials and components from damage.

The location and size of space to allocate materials and equipment will be planned carefully as part of an overall site layout plan before work on site commences and will be part of Contractor's site area.

Prior to laying of materials, particular care will be done in the preparation of the soil, which must be compacted, smooth and free of foreign bodies and any protuberances. For sheet materials storage it is also recommended to check the surface of the soil during laying of rolls that do not contain any water stagnation.

Sheet materials that for any cause should remain uncovered at the end of the working day will be covered with appropriate polyethylene cloth or similar means.

2.6 Preparation of the foundation

Re-engineering of the cell includes modification of the existing eastern (and south, if necessary) Ghallis cell side slope by trimming an approximate triangular section of the former Ghallis landfill in the way to guarantee the necessary space for the construction of the patented retaining structures.

The excavation will be executed by an excavator and a loader. The existent profile of the scrap will be modified and re-compacted by a compactor that will ensure the stability of the new scrap. The side slopes of the excavated will be adjusted as needed to meet stability, as per calculations related to stability into the Stability Risk Assessment.

To facilitate site preparation, removed waste material will need to be deposited at the existing tipface currently being used at the Ghallis landfill by WasteServ Malta Ltd..

After completion of the works, a layer of terrain will be placed over the excavated face with a minimum of 150 mm thick layer of soil or an alternative material that provide equivalent performance to soil. This material can consist of native soil or other appropriate material such as construction materials, or geosynthetics.

2.7 Preparation of foundations and extension of the basal liner by welding to existing landfill liner to extend containment

In order to guarantee the continuity of the liner of the existing cell with the new cell, it will be realized an excavation for searching the existing HDPE.

Surveyors will conduct the site survey to mark the lines and levels of the objective excavation for foundations as per indicated in the approved drawing. The side slope of excavated area will be sloped no more than 40 degrees and will be maintained to avoid a collapse of the bank into the excavated area, as per calculation made (refer to the Stability Risk Assessment, Appendix E). The depth of the bank depends on how deep is the HDPE into the ground.

The new cell area will be constructed above the base of the existing liner system of Ghallis landfill allowing the continuity of the HDPE within the old and the new cell.

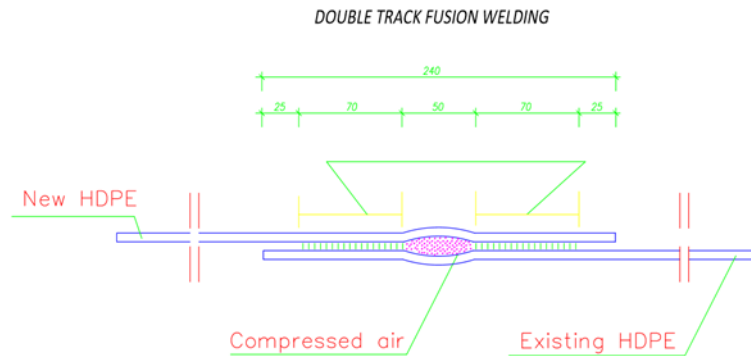
The laying of the waterproofing lining system is performed on regularized and prepared surfaces in such a way to exclude any kind of damage.

The GCL will be laid in place in overlapping strips. The impermeability of the overlaps between the edges of the various strips will be achieved by incorporating the edges of the two geotextiles overlapped in loose dry bentonite, which turns into gel if hydrated.

The HDPE geomembrane is laid by placing contiguous strips, superimposed on the edges. Its installation is quick: the strips carried by the roll will be laid together next to each other with one lateral overlap and then are welded with the following types of welding:

- double track with channel test;
- extrusion with overlapping cord (in the case of local repairs at the crossing points of more welds and in specific points where it is not possible to realize the double track welding).

HDPE WELDING



The weld between the joints will be made by using double-track welding equipment acting through the heat supply with a hot wedge, and speed and temperature will be controlled through sophisticated equipment; with the help of a pressure regulator it is established the closure of the rollers.

For a specific control of the welds, the pressure test will be applied to the internal channel of the two tracks (for more details, see the UNI 10567). It consists in inserting gas inside the channel, which must hold the same pressure or change for a maximum of 10% for a time of min. 10. The manual extrusion welding will be made by adding melted material spread on surfaces prepared by specialized personnel.



Figure 1: HDPE welding

The HDPE geomembrane is protected at the top with a non-woven geotextile strips from the coils, operating from top to bottom; the strips will be positioned in overlap, similar to HDPE and heat-welded to each other.

In order to stabilize and waterproof the foundation, it will be installed a prefabricated T-wall, waterproof through the laying of the liner system.

After guaranteeing the continuity of the waterproofing liner system, the dig will be fill up with inert material and sand for protecting the liner and reach the ground level. The T-wall has the main function to delimit Ghallis from Maghtab.

For foundation, as soon as the excavation reaches the required depth the surface will be levelled and will be compacted. Before the compaction starts, it will make sure that the excavated level is free from standing water or excessive moisture content. Inspection will be conducted during compaction for checking and approval of the Project Manager.

Construction of the new cell foundation will cover an area of approximately 10,000 m² and will require approximately 5,000 m³ of inert mixed stabilized material to construct the layer overlapping the liner, sealed with a geocomposite woven. This foundation layer will be realized over a layer of 0.3m thick gravel sealed with a geocomposite woven or geogrid.

Part of the realization of foundation works is shown in the photos below.





Figure 2: Example of foundation works

2.8 Construction sequence of the patented retaining structures and waste disposal

The following is an outline of the principal sequence of construction for patented retaining structures.

- Placing of steel frames on the foundation bed, at the outer boundary of the retaining wall;
- Laying of the bottom geo-net layer;
- Inclusion of vertical reinforcements (electro-welded steel mesh) as support for the outer mineral liner;
- Draping of geocomposite materials used for gas drainage (on the inner side of the landfill layer) and water drainage (on the outer side of the landfill layer);
- Outer capping soil and mineral clay layers laid, and held in place with HDPE monofilament net;
- Waste laid in 0.5m layer, compacted, and covered with a geo-net after 1m; and
- The above process repeated as necessary until the required height is achieved.

In the area between the prefabricated concrete T-wall and the retaining structure for waste will be realized the external drainage system for rainwater with gravel and a ditch (ø250).

A layer of daily cover will be placed over the tip face at the end of each day with a minimum of 150 mm thick layer of soil or an alternative material that provides equivalent performance to soil. Daily cover can consist of native soil or other appropriate material such as construction materials or geosynthetics. Daily cover for the excavation area will be necessary to prevent rats, flies, and other disease vectors from entering or exiting the landfill, to control the blowing of waste materials, control scavenging, reduce odours, and control the entry of runoff into the landfill during operation and the emission of landfill gas.

A simple description of the construction phases and technical details of the retaining structures for waste are appended to this document.

Part of the realization of the retaining structures for waste is shown in the photos below.



Figure 3: Construction phases of the retaining structures for waste

3.0 Health and Safety Management

3.1 Health and Safety Documentation

Before commencement of Work at Site, the Contractor will provide to WasteServ Malta Ltd. a Health & Safety Risk Assessment dedicated to the Site that will be realized by a contracted consultant.

3.2 Safety Management Compliance

The Contractor will adhere to all current and relevant parts of the Labour Code and in addition any relevant requirements of the Code of Construction. All aspects of the European, Maltese Codes and associated articles pertaining to safety and health will be complied with and that the management of safety and health and the application of protective and preventative measures to minimise risk, as deeply indicated in the Health & Safety Risk Assessment, is applied diligently, competently, and in accordance with industry best practice at all stages of works including design, and planning.

3.3 Emergency Procedures

The Contractor will present his safety and emergency procedures for the Works for approval by the WasteServ Malta Ltd. prior to commencement of the Works at site to cover both the construction and operation of the Plant, as described in the H&S Risk Assessment.

3.4 Accident and Incident Reporting

Any accident or safety incident will be reported to the WasteServ's Representative at the first available opportunity, as per H&S Risk Assessment.

4.0 Programme Management

4.1 Project Time Schedule (PTS)

The Works will be carried out and completed in accordance with the key events identified in the Project Time Schedule unless otherwise agreed with WasteServ Malta Ltd.'s Representative. A summary Project Time Schedule will be annexed to the Construction Method Statement.

4.2 General Requirement

Schedules supplied by the Contractor will be only used by the Client's Representative to monitor the progress of the Contract. The Contractor will report any occurring changes, to agreed programmes.

5. Workplace access

Access and egress to site will be provided by Wasteserv Company Ltd.

Access around the site will be assessed before starting work to ensure it is safe and will be decided with respect to the "Health & Safety Risk Assessment" and the "Fire Risk Assessment". Contractor's area of intervention will be defined with proper site boundaries in the way to avoid any kind of interference and better define the working area.

6. Workplace Lighting

Work is outside and natural light is suitable to do the task.

7. Working area Equipment - Machinery:

Mechanical equipment to handle materials will operate in accordance with the Health & Safety Risk Assessment guidelines. Equipment to be utilized for the proposed project are the following:

- Truck
- Excavator
- Crawler and/or loader
- Compactor
- Bending machine
- Vibratory plate

All equipment will be maintained in an efficient state, in good repair and in good working order through a systematic, planned and documented maintenance.

After daily completion of the works, equipment will be stored in an appropriate location or in the working area.

Landfill operators will refer to machine operations manuals, develop and implement maintenance schedules and conduct daily inspections.

8. Number of workers

It should be considered four people for foundation works and 3 people for side slope lining system. In the working area there should be no more than 3 representatives of the contractor company.

9. Hours of Work

It is anticipated that the core working hours for the construction will be set out as follows:

- 07:00 – 14:00 hours Weekdays;
- 07:00 – 12:00 hours Saturdays if required; and
- Working on Sundays is not planned but under exceptional circumstances, works may be planned and will be subject to reasonable notice.

10. Construction Vehicle Movements

Contractor's equipment movements during construction phase will not need to be monitored with traffic management and/or logistics plans because they will be confined to the designated working area.

When vehicles carrying waste are approaching the tip-face, there will be a point at which they are stopped. Good communication systems will be in place to enable clear directions to be given between delivery vehicles and landfill operational plant, for example using radio telephone communications or a points-person. This applies to vehicles arriving and leaving the tip-face area.

11. Signage

Adequate signage will be installed such that vehicle deliveries and access to the site are clearly defined within the general site geographical area. A main construction signboard will be positioned in agreement with the Client. Site signage will be provided within the curtilage of the site as necessary to advise operatives/visitors and delivery staff of safety requirements within the confines of the site and where to report on arrival.

12. Special Control Measures

At the current state, special control measures are not required.

13. Site office & Facilities

A temporary, transportable site office will be installed to accommodate the contractor's supervisor, the developer's representative as well as provide space for site meetings. A portable steel container will be used for on-site operators and for storage of small construction equipment. Two portable chemical water closets will also be provided. The designated area for site offices has been identified in the area in front of WasteServ Ltd. on-site offices. More depply information are given in the H&S Risk Assessment.

14. Environmental measures

Wherever possible, excavation will be carried out limiting the dust generated during excavation.

Working area will be periodically sprayed with water to ensure that no fines are lost.