

MAGHTAB LANDFILL

RODENT ASSESSMENT

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Abstract

The Maghtab landfill has been operational in Malta since 1977 and has absorbed most of Malta's waste for the past twenty-six years (**Plate 1 & 1.1**). No Rodent Control Programmes have ever been adopted since its inception. The Health Department's Rodent Control Section at times carried out sporadic rodent baiting. However, these inconsistent visits only seemed to cover specific areas and certainly did not embrace the entire landfill.

Project Objectives

In a report commissioned by The Ministry for Resources and Infrastructure, Scott Wilson revealed that: "There are known to be a large number of rodents scavenging at the site....". The overall objective of this project is to investigate and propose an optimal treatment plan for the implementation of an on-going Rodent Control Programme at the site.

Procedure

The Rodent Assessment was implemented in three stages:

First Stage:

- Identification of the Rodent species.
- Choosing a specific Bait Station Marker.
- Plan of the Landfill.
- Installation of the Bait Station Markers.
- On-site location and charting of each Bait Station.

Second stage:

- Baiting of each Bait Station.
- First Bait Station Inspection.
- Re-baiting of each Bait Station.

Third stage:

- Second Bait Station Inspection
- Conclusions
- Proposals for a specifically designed Rodent Control Programme for the site.

Implementation – First Stage**• Identification of the Rodent Species**

Prior to the initiation of the actual Rodent Assessment, a series of procedures had to be completed and heading this list was the identification of the species of rats presently scavenging the Maghtab Landfill.

In one of our initial surveys at the Landfill, rodent droppings were noted in various areas. Photos of some of these particular areas were taken (**Plate 2 & 2.1**) and also samples of such droppings were collected for further investigation.

Identifying the rodent species from the droppings we had seen on site was not a straightforward job. Even though the way the droppings were grouped and their spindle / ellipsoidal-like shape lead one to immediately point to *Rattus norvegicus*, other droppings next to, and amongst the ones attributed to *Rattus norvegicus*, were sausage or banana-shaped, which could lead one to associate such droppings to *Rattus rattus*.

Even though, as explained in the previous paragraph, most of the evidence seemed to point to the Common Rat, a night visit was organised at the Landfill to actually try and see the rodents in the open and if possible record them on film. With all formalities complete and security personnel alerted of our intentions, a night visit was organised for 23:30 hrs.

Proceeding to the refuse tip at the very top of the Landfill, and keeping stationery, we could see at close distance the hustle and bustle of rats going about their business. This left us in no doubt that the species of rodents we were actually seeing was *Rattus norvegicus*. Identifying such species, even in areas where sample droppings were collected, left us in no doubt about the major inhabitants of the Landfill in question. Though cautious of the strong torch light beam, the rodents allowed us to film most of their action, and 'stills' have been extracted from the actual videotape (**Plate 3 and 4**).

The Norway rat - *Rattus norvegicus* averages an adult weight of approximately 330 grams, even though a larger specimen has been known. It has thick, opaque short ears with a blunt snout and a tail slightly shorter than head and body, which is dark above and lighter below. The colour usually varies from brownish grey to grey-black with a lighter underside. It is omnivorous and capable of feeding on a wide range of food. It thrives and reproduces best in localities that provide a rich and varied diet. Its distribution is everywhere, both urban and rural (**Plate 5**).

- **Choosing a specific Bait Station Marker for the job**

Considering the unique terrain conditions on which the Assessment was to be conducted, a specific Bait Station Marker had to be chosen, which would need to be both visible and easily located from a distance. The terrain does not only consist of boulders of all sizes and building debris, but also of various 'terraced plains' that make up the actual slopes of the landfill, and which vary in number and height.

Bearing in mind the above-mentioned environment, a specific Bait Station Marker was devised 'in-house' (**Plate 6 & 6.1**) and which consisted of:

1. Thick plastic tubing of approx. one meter in length.
2. A thin aluminium plate secured at the top of the pole onto which the specific bait station number would be written on one side and an Identification Sticker on the other.
3. Half a meter of brightly coloured thin plastic strip, secured at the top end with the aluminium plate to enhance visibility.

Due to the fact that the above-mentioned Bait Station Markers would have to be hammered and secured into the ground, an iron pipe of identical thickness to the plastic tubing was primarily deployed to absorb the hammering impact, needed to create the initial hole into which the plastic pole would eventually be inserted and secured. Such a procedure was obligatory to avoid damage to the actual plastic pole by hammering directly onto it.

- **Plan of the Landfill**

Even though a professional Sketch Layout (**Figure 1**) indicating the outer perimeter area of the Landfill had eventually been commissioned for the Scott Wilson Report, no detailed and 'to scale' plans of the present day Landfill existed. One of the main reasons that make this a rather difficult task is the continuous shifting of 'ground', shaping the different pathways and formations in the 'terraced plains' surrounding the landfill slopes.

The plan presented to us (**Figure 2 & 2.1**) on which we had to conduct our study was the most recent one at the time, drawn out mostly in 'free-hand', and outlying the site as at the end of August 2003. Such a plan was drawn up by the manager on site, Mr. Charles Zerafa.

The fact that most of the above-mentioned plan was drawn 'free-hand', presented us with the difficult task of 'on-plan' identification for each Bait Station Marker on the landfill.

- **Installation of Bait Station Markers**

Considering an approximate length of 2.5 kilometres for the site perimeter, together with a resultant height of approximately 80 meters, a considerable number of Bait Station Markers had to be prepared before hand. A total of approximately 200 Bait Station Markers were commissioned and manufactured in-house.

Having established the species of the main rodent variety infesting the site and taking into account the fact that *Rattus norvegicus*'s runs have a typical range of approximately 50 meters, it was decided to space out the Bait Station Markers accordingly in both vertical and horizontal latitudes. This would ensure that each Bait Station's 50-meter diameter would be adequate, and within easy reach of nearly each rodent's particular route.

In keeping as faithful as possible to the determined distance between Bait Stations, a nylon cord measuring 50 meters in length was used to correctly calculate such a distance.

- **On-site location and charting of each Bait Station**

Week starting Monday the 4th of October 2003 was identified as a commencement date for the location and charting of each Bait Station Marker on the landfill. Considering the difficulty in accessing such a difficult terrain and the vastness of the area to be covered, we anticipated that a team of four pest control technicians would require at least four full working days to manage such a task.

The exercise proceeded as planned and by the end of the week a total of one hundred and seventy (170) Bait Station Markers were erected on-site in each specific location as planned. Besides being numbered, each Bait Station Marker was also meticulously matched to its location on the plans available. (**Figure 3 & 3.1**)

Implementation – Second Stage

- **Baiting of each Bait Station**

Baiting of all stations on the landfill was taken in hand on Tuesday 14th October and completed in one day. The method of baiting chosen was to attach three different types of rodenticides at a distance of approximately 15 cms from each other onto a 1.5 meter length of soft wire, which in turn would then be anchored and secured to the Bait Station Markers (**Plates 7 and 8**). The 1.5-meter length of the wire was intended to prevent the exposure of the rodenticides to non-targeted species and therefore allow the baits at the end of the wire line to be placed in openings amongst boulders and other debris.

The chosen rodenticides were attached to the wire in the following order:

1. A 20-gram cereal / wax block containing a second-generation bait - 0.005% brodifacoum - and which was secured to the very end of the 1.5 meter-length of wire line.

2. A 10-gram 'Fresh Pasta' bait bag, also containing a second-generation bait - 0.005% brodifacoum - and which was secured along the wire line and approximately 15 cms away from the wax block.
3. A 25-gram sachet containing 0.005% Chlorophacinone - a first generation bait in pellet form. This was also secured to the wire line at approximately 15 cms. away from the Pasta Bait.

The choice of such a baiting system was mainly adopted to present the best possible attraction for the rodents on site, and to ensure that in rodent prone areas at least one (if not all of the three different baits), would surely appeal to the rodents.

The constant dumping on the site of organic matter normally derived from domestic and abattoir waste, would surely provide an abundant food source to the rodents, and surely one would have to be certain that the rodenticides used in this exercise were appealing enough to entice the rodents' attention. It is widely acknowledged that rodents tend to stick to their own feeding habits, but when they find food sources that are more palatable they will tend to go for such a source.

The choice of 'Fresh Pasta' baits would therefore provide rodents with a high palatability bait that would provide an alternate and tempting food source that rodents would usually go for. In fact out of the three different types of baits chosen for this Assessment, Pasta bait was classified as the first in the line of baits that the rodents would go for.

For the scope of this particular exercise we intend to classify the three different baits chosen according to palatability, in the following order:

- ✓ The Fresh Past Bait
- ✓ The cereal / wax Bait Block
- ✓ The pellet form Bait

This sequence in order of palatability will certainly be a considering factor in our final conclusions, when all data would have been collected from each of our subsequent Inspection Visits. The sequence in the choice of rat bait when feeding at each Bait Station may shed additional light, taking into consideration the specific rodents on the Landfill and their specific environment.

• **First Bait Station Inspection**

Due to a known fact that *Rattus norvegicus* usually has a fear of new objects, (known also as neophobia), one should bear in mind this information especially when checking baits after an initial baiting exercise. In view of the foregoing it was decided to start our first Bait Station Inspection on Monday the 20th of October, i.e. six days after the initial baiting. Such a period is normally adequate despite the 'neophobia' effect, and would normally provide a greater chance for the rodents to discover most, if not all, of the Bait Stations located on the entire Landfill.

Specific Bait Station Inspection Sheets (**Figure 4**) were designed for this particular exercise, allowing for the maximum-possible information to be recorded.

From the 170 Bait Stations installed on the Maghtab Landfill, the first 'overall' Bait Station Inspection yielded the following results:

Table 1.

	Number of Bait Stations	Percentage
<i>Full Takes</i>	146	86 %
<i>Part Takes</i>	19	11 %
<i>No Takes</i>	Nil	-
<i>No Record</i>	5	3 %

The following table, derived from our records for each separate Bait Station, indicates the total amount of Bait Stations in a related percentage to each separate rodenticide used and to each different quantity of bait consumed, as itemised in various subdivisions. The said percentages were calculated on a total of 170 Bait Stations:

Table 2.

	Cereal / Wax Block - %	Past Bait - %	Pellet Bait - %
No takes	2 – 1.2 %	1 – 0.6 %	8 – 4.7 %
Partial Takes	NIL	NIL	2 – 1.2 %
¼ Takes	NIL	NIL	2 – 1.2 %
½ Takes	NIL	NIL	5 – 2.9 %
¾ Takes	1 – 0.6 %	NIL	2 – 1.2 %
Full Takes	162 – 95.3 %	164 – 96.5 %	146 – 85.9 %
No Record	5 – 2.9 %	5 – 2.9 %	5 – 2.9 %
Total	170	170	170

The identification number of Bait Stations with varied partial takes (11%) has been noted and their respective corresponding position highlighted on a separate plan (**Figure 5**). Such a plan shows clearly the position of such stations and their related areas on the landfill site. These areas have been highlighted by three colour codes in the following sub-divisions:

- Bait Stations indicating a 'part take' on the Pellet Sachet, with a 'full take' on the Bait Block and Past Bait.
- Bait Stations indicating 'no take' on the Pellet Sachet, with a 'full take' on the Bait Block and Past Bait.
- Other varied 'part takes'.

The first Bait Station Inspection yielded also the discovery of two dead rodents of the *Rattus norvegicus* species, one next to Bait Station no: 90 (**Plate 9**), and the other next to Bait Station no: 164 (**Plate 10**).

- **Re-baiting of each Bait Station**

During the course of the first Bait Station Inspection, all Bait Stations were re-baited in preparation for the second Bait Station Inspection, which was planned for Monday 27th October.

Taking into consideration the initial results obtained from the first Inspection Visit, which indicated that the rodent problem was widespread, and taking into account also that practically a 'Full Take' was recorded on all Bait Stations, it was decided that the three different types of rodenticides on each Bait Station would not be necessary the second time around. One must bear in mind at this stage that the second Inspection Visit was only being conducted in order to sustain the results of the first Inspection. Consequently, all Bait Stations were each re-baited with only one Cereal/Wax Bait Block.

Implementation – Third Stage

- **Second Bait Station Inspection**

As indicated above, the second Bait Station Inspection Visit was carried out as planned on Monday 27th October, six days after re-bait of all Bait Stations. This particular exercise was concluded in one day. Even though the results obtained in our previous inspection indicated that the 'neophobia effect' was, in this particular case, not a serious consideration, it was decided that in conformity with our previous baiting period, a six-day interval would also be allowed this time. This would also ensure that the final assessment could be evaluated on equal time-periods, for both the first and second Inspection Visits.

As previously adopted in the course of our first Bait Station Inspection exercise, specific Bait Station Inspection Sheets (**Figure 4**) were used for this particular exercise as well.

Hereunder are the results obtained from the second Inspection Visit:

Table 3.

	<i>Number of Bait Stations</i>	<i>Percentage</i>
Full takes	155	91 %
Part takes	12	7 %
No takes	3	2 %
No Record	NIL	NIL

The following table, derived from records pertaining to each separate Bait Station, indicates the total amount of Bait Stations in a related percentage to the rodenticide used and to each different quantity of bait consumed, and as itemised in various subdivisions. The percentages were calculated on a total of 170 Bait Stations:

Table 4.

	Cereal / Wax Blocks	Percentage
No takes	3	1.8 %
Partial takes	3	1.8 %
¼ takes	1	0.6 %
½ takes	6	3.4 %
¾ takes	2	1.2 %
Full takes	155	91.2 %
No Record	NIL	NIL
Total 170 Bait Stations		

Weather Conditions:

It would be pertinent to remark at this point, that the weather conditions during the Baiting Periods prior to the First and Second Inspection Visits, i.e. from the 14th to the 27th October 2003, were normally mild with occasional showers mostly on two particular days during the above-mentioned period. Heavy rainfalls (which could have had a determining negative factor) were not recorded, and the prevailing average temperature throughout was that of approximately 24 deg. Celsius.

• **Conclusions**

Results obtained during the course of the Assessment at the Maghtab Landfill clearly show that the rodent infestation at the site is widespread. Popular beliefs that the heavier infested areas would be closer to the tipping site, where fresh organic matter is deposited on a daily basis, have now been contradicted. This theory may be sustained by the simple fact that during the first Inspection Visit, a maximum of 164 Bait Stations (96.5%), out of the 170 put down on the entire site, showed a complete take of the Pasta Bait and the Cereal/Wax Block.

This alone may indeed justify the 'fear' referred to in the Scott Wilson report, which in section 3.2.1 states that: "There are known to be large number of rodents scavenging at the site and local communities are gravely concerned that when the landfill closes such vermin may relocate to other areas closer to local populations."

The results clearly show that the re-location of rodents from the site to other areas is distinctly possible, even at this very moment whilst the site is still being used.

Bearing in mind that:

- a) extensive wanderings by rodents are not the rule;

- b) the daily fresh deposits at the site are usually at the tip, which is approximately 80 meters above ground level;
- c) rodents are territorial and the average run of a *Rattus norvegicus* does not usually exceed 50 meters;
- d) rodent infestations are widespread on the Landfill, even at the very base of the site itself.

one may conclude that the rats at the very base of the site are not finding food as readily as their counterparts that have established their colonies in the close proximity of the tipping site. The Landfill itself has been in operation since 1977, and therefore the food supply at the very base of the tip could now be very limited. This factor could leave the rodents present at the edges of the Landfill no option but to travel a considerable daily distance to forage for food or indeed migrate to other areas, which obviously will be closer to local populations.

The above may be readily substantiated by many using the stretch of coast closest to the Landfill for their recreational activities and barbecues - witnesses to a considerable number of rodents encroaching onto the shoreline after sunset scavenging for food, not only their own, but also for food waste deposited in bins.

Even though edible waste will cease to be deposited next year, the site will still provide enough food to support colonies of rats close to the tipping face for a number of years to come. However, as expected, rats will surely forage elsewhere for food once the supply of food becomes scarcer.

A most important factor that should not be excluded is - **Water**. *Rattus norvegicus* requires a constant supply of water so as to have optimum breeding conditions. The study, as already intimated, indicated that the Pasta Baits in 96.5% of all Bait Stations were completely taken. Such a fact not only indicates that the problem is wide spread across the entire Landfill, but also that this behaviour may indicate that the rodents were attracted to this kind of bait not for lack of food (especially when this is abundant at the tipping face), but because for the high moisture contained in the particular bait.

The lack of readily available water at the site may be a prime reason why the current number of rodents did not blow up to epidemic proportions. The Norway rat is most prone to suffer from water shortage, and under extreme conditions of deprivation fertility declines.

To sustain this theory it may be stated that, even though a considerable number of rats in the course of our night surveys were noted in areas close to the access roads leading to the Tipping Face, the rodent activity at the site (even when we know now that the rodent problem is widespread), was not as high as one would have expected. Furthermore, even though at one particular area of the Tipping Site a considerable high number of rats were noticed, the quantity could not be described as astronomical.

In view of the foregoing, the question of availability of free water at the site, especially in the dry months, would need to be given serious consideration especially when formulating a specific 'Treatment Programme' for the Landfill.

- **Recommendations**

Continuous supply of food and availability of water, especially in the coming winter months, is bound to increase the rodent population at the site. We must therefore emphasise that an on-going Pest Control Programme be initiated without undue delay. The landfill has been operated for too many years without an on-going Rodent Control Programme, and no additional time should be wasted in this respect. Furthermore, if more time were left to slip away before action is taken, another thorough, time-consuming and expensive exercise would have to be carried out again to re-evaluate anew the rodent situation again.

We have no idea of the total rat and mouse populations on the site, even though our exercise concluded the infestation is wide spread across the landfill. An indication may only be established once a Rodent Control Programme is set in motion and regular feeding patterns calculated. We recommend that a Rodent Control Programme for the Magtab Landfill should be addressed as follows:

- a) A full 'Blitz' Treatment consisting of an initial mass depletion of rodent populations by using (on a one-time basis only) a chronic poison, which would ideally be added to a specific choice of bait – ideally of the palatable and moist variety. Such a mixture would then have to be equally distributed across the entire landfill in specific Bait Stations and kept there for a period of one week. All the necessary precautions would need to be taken to ensure that the rodenticide is not taken by non-targeted species, with a minimum of one inspection visit of all stations to be carried out within the specified time-period.
- b) The re-baiting of all stations utilising cereal/wax baits with regular weekly inspections in the initial stages of the Programme to replenish each Bait Station, according to the various feeding patterns of the rodents in each specific area. Once this feeding pattern is established, the inspection intervals could be extended or adjusted accordingly to ensure a constant and uninterrupted supply of rodenticides on all Bait Stations at all times. The cereal/wax baits may be supplemented by liquid rodenticides in the warmer months. This would be additionally appealing to rodents.

- **Declaration**

This is to confirm that to our knowledge, the above Rodent Assessment carried out at the request of WasteServ Malta Limited at the Maghtab Landfill, was conducted in accordance to client's requirements and delineates, in the first instance, the current rodent situation at the site, moreover endorsing a sound recommendation for a professional Rodent Control Programme.

Further information and clarifications about this presentation may be obtained, either from the Author himself, Mr. Ronnie C. Galea CBiol, MIBiol, FRSH, RPPT (Adv.), FIHPE, MBPR (PHPC) or from Collaborator, Mr. John Kay CBiol, MIBiol, FRSH, FRIPHH, MBPR (PHPC).