Te Maunga Argentine Ant (Linepithema humile) Management

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Chapter 1: Introduction

Argentine ants were first recorded in New Zealand in 1990 at the site of the Commonwealth Games in Auckland. Since then they have been found in many areas of the North Island and were first discovered in the Bay of Plenty region in 1998. To date the ants have been recorded in at least 23 sites in Tauranga, Rotorua and Mount Manunganui, including the 60 ha infestation at Te Maunga.

The current Bay of Plenty Regional Pest Management Strategy (Operative 2003 – 2008), prepared under the requirements of the Biosecurity Act (1993), provides for the management of the Argentine ant as an eradication pest animal and defines the objectives, management responsibilities, rules, statutory obligations and offences relating to each pest category.

The Te Maunga site is considered both a high-risk site and an ecologically sensitive site, due to the nature of the business activities and the type of wetland habitat that exists within the infestation area. As the ants have now become well established, eradication (even small-scale) is not believed to be technically possible given currently available resources. The best option available at present for large infestations is containment and population control. To this end Environment Bay of Plenty implemented a limited Argentine ant control programme at Te Maunga in January 2006.

This report has been generated in response to a request by the affected landowners in order to present the history of the infestation and the logistics and results of the recent control programme. Future initiatives for the continued containment of the ant and prevention of the further spread of the infestation are also discussed.

1.1 Background Information

1.1.1 Biology and Ecology of the Argentine Ant (Linepithema humile)

The Argentine ant is categorised as a 'tramp ant' species. Tramp ants share the following features that enable them to be highly successful invasive species (Harris, 2002):

- **Formation of super-colonies.** In their native habitat the Argentine ant displays marked inter-colony aggression, however outside of this the ants tend to form one large colony with a regular interchange of workers, leading to higher densities and foraging activity in their introduced range.

- **Aggressive nature.** The aggressive nature of the workers along with their sheer numbers allow the Argentine ant to displace most other ant species currently found in New Zealand.

- **Polygyny, mating and dispersal.** Nests are polygynous (many queens) and during summer each queen can produce up to 60 eggs a day. Mating occurs in the nest and natural dispersal is by 'budding' where a number of workers and queens break from the nest walking to a form a new nest. This means that the natural dispersal rate is approximately 100 m per year.

- **Jump dispersal.** Although the natural dispersal rate is slow, humans increase the dispersal rate spatially (jump dispersal) through the transportation of queens and workers in rubbish, food, vehicles, soil and garden products leading to the formation of many satellite colonies.

- **Diet.** A generalist feeder, the Argentine ant diet includes: insects; nectar; seeds; carrion and honeydew secreted by aphids and scale. The Argentine ant is an effective 'farmer' of aphids and scale, protecting the insects from their natural enemies in return for the honeydew they secrete. The ant is also known to move them from plant to plant to increase honeydew production.

1.1.2 Impacts

The above features have led to the Argentine ant becoming one of the world's worst invasive and problematic species. It is now found in 26 countries. In its introduced range the Argentine ant has the potential to have a negative impact on horticulture, commerce, conservation and household residents.

There are reports from Auckland that the Argentine ant has killed trees through desiccation, by nesting directly beneath the trees and farming aphids and scale. Lester and Longson (2002) have recorded Argentine ants in several commercial horticulture crops, including citrus, grapes, stone fruit and pip fruit. Kiwifruit, a highly valuable crop in the Bay of Plenty region is deemed to be at "medium-low risk" of economic impact from the Argentine ant (Lester and Longson, 2002). To date the Argentine ant has not been recorded as a problem on kiwifruit.

As the Bay of Plenty region has a large horticultural export sector and New Zealand's largest port in terms of tonnage, the Argentine ant has the potential to impact on the region's ability to comply with export requirements. Asian countries like China and Korea remain free of the Argentine ant and the possibility of exporting contaminated goods to these countries would be detrimental to our trade image.

In urban areas, Argentine ants are severe pests, persistently invading homes and commercial buildings in large numbers as they forage inside for food, water and shelter. In heavily infested areas residents are unable to live, relax or work comfortably inside or outside the home without the ants climbing over their feet and legs and trailing through beds at night. At a Mount Maunganui food outlet, the ants have continually swarmed over the stock and on many occasions the food has had to be thrown out at considerable loss to the business.

The Argentine ant is also a threat to conservation. The ants displace indigenous ant species and other invertebrate species through direct predation or competition for food, water and territory (Harris, 2002). Lester and Longson (2002), observed the ants attacking a Hastings beekeeper's hive in large numbers, killing many bees. Indigenous species that rely on nectar and insects could also come under threat from the Argentine ant through food competition, including rare nectar-feeding birds such as the stitchbird and the bellbird. The ants have also been observed swarming into birds nests, driving out the adult bird and attacking the chicks, which is of particular concern to indigenous ground nesting marsh birds such as those found at Te Maunga.

1.1.3 Current Control Options

Currently in New Zealand the only effective option for control is the use of Xstinguish™ Argentine Ant Bait. Xstinguish™ bait is a water-soluble food-based paste that is a mix of sugar and protein. It contains the toxin fipronil which is a neurotoxic insecticide commonly used in cat and dog flea treatments and in cockroach baits.

Bait concentration trials that were conducted by Environment Bay of Plenty show that the most effective control occurs with fipronil at a concentration of 0.01% (Dykzeul, 2001). At this level of concentration the bait is not considered to be harmful to humans, cats or dogs. It is however toxic to fish and aquatic organisms, particularly in standing bodies of water.

The application method is very labour intensive as the bait is applied by hand in a grid pattern at 2 m – 2.5 m spacings. This makes control in large areas very expensive and in some cases impossible in terms of accessibility to all areas of ant habitat.

Biosecurity New Zealand recommends re-applying bait 6-8 weeks after any initial control to kill any surviving ants or those that have subsequently hatched. The use of a longer-term insecticide product called Ant Stop G along boundaries is also recommended to slow the rate of re-infestation from neighbouring untreated properties.

Chapter 2: History of the Te Maunga Site

Argentine ants were first discovered in Te Maunga during a delimiting survey conducted by Environment Bay of Plenty in 2000. It was initially thought that they were confined to a small area at the Transfer Station however in 2001 monitoring found that the actual area of the infestation was 50.089 ha encompassing the Water Treatment Plant; Te Maunga Wastewater Treatment Plant; the Transfer Station and TrustPower (Figure 2.1)

This site was used as a non-treatment control site during bait concentration trials in 2002. Yearly monitoring since 2001 has shown that since its discovery the total area of the infestation has remained relatively static since 2002. Of concern however is the spread of the ant into the paddock adjacent to Revital Composting placing the infestation 120 m from the current composting operation. This paddock is also marked for development for the future expansion of the composting operation.

Figure 2.1 Boundary denoting area of Argentine ant infestation Te Maunga 2005.

2.1 Barriers to Effective Control

Due to the size of the infestation, the type of the surrounding habitat and the nature of the business activity at the Te Maunga site it is considered both a sensitive and a high-risk site. This places barriers to effective control using the current available toxins and application methods. The site is constantly exposed to re-infestation and has the potential of being a vector for the further spread of the ant to other areas in the region.

The business activities at the site all include high vehicle movements onto and off the site and in some instances vehicles and goods can travel to and from areas all over the Bay of Plenty and possibly to ecologically sensitive areas. The business activities also include storage of equipment on site including equipment involved in gardening and soil movements. As the site also encompasses the Transfer Station there is the likelihood of continued re-infestation with waste, in particular green waste being transported to the site from other Agrentine ant infested sites around the Tauranga area.

Current research both overseas and in New Zealand also shows that the surrounding habitat (coastal scrubland) is considered a highly suitable environment for Argentine ants (Ward and Harris, 2005). The scrub that borders the western fence line of the TrustPower site has high numbers of Argentine ants with large trails found throughout this area.

Other barriers to effective control include the fact that the estuary forms the southern boundary of the infestation with many drainage ditches throughout the area. There is also a small area of sensitive saltmarsh habitat making the application of Xstinguish bait restrictive due to its toxicity to aquatic organisms. The use of the produce Ant Stop G is also restrictive for the same reasons. The Wastewater Treatment Plant and the surrounding habitat also raise the issue of health and safety and accessibility due to the current method of control (hand application).

Current and proposed future development at the site further into ant habitat and the subsequent disturbance could also increase the risk of spread of the ant. These barriers, along with the lack of good information on Argentine ant re-infestation rates hinder the development and the implementation of an effective control plan.

Chapter 3: The Control Programme

As control of the total area of the infestation is both problematic and cost prohibitive it was decided that the best approach was to create a temporary buffer between the infested area and the businesses concerned by only treating within the footprint of the businesses and the paddock adjacent to Revital Composting. This will reduce the ant population in areas of high vehicle and material movement where there is a high risk of accidental spread. The total area to be treated was approximately 12 ha (Figure 3.1).

To help ascertain the effectiveness of the control programme a monitoring programme was also implemented and monitoring was conducted 5 days prior to treatment and 17 and 78 days after treatment. The Water Treatment Plant was not included in the monitoring programme due to current large-scale development taking place at the site. Standard methodology for monitoring was used involving the systematic placing of vials using a non-toxic bait (Xstinguish® Monitoring Paste). A total of 49 bait vials were established within the control area.

All affected businesses were contacted and informed of the impending control and given relevant information on the ants, the bait and the control programme. TrustPower, Tauranga City Council and Revital Composting granted access to the treatment areas and Environment Bay of Plenty consulted with the Medical Officer of Health prior to the bait being laid.

Bay Pest Services were contracted to lay the bait. On 17 January 2006 the TrustPower, Water Treatment Plant and the Revital sites were treated. On 18 January the Transfer Station was treated. Both days were fine with scattered cloud and temperatures reaching 24°C maximum.

The bait was applied around all buildings and fence lines at the TrustPower site and all gardens were baited except those along the eastern fence line, as ants were not found here during the monitoring. The gardens along the front of the TrustPower building however were baited as a precautionary buffer. The southern and eastern fence lines were double baited due to the high numbers of ants present in the adjacent land.

At the Transfer Station bait was laid to the east and south of a line extending from the weighbridge. All the gardens in this area were also baited. Bait was laid in a grid fashion in the adjacent paddock that is used as a storage site for recyclable material, again west of a line taken from the weighbridge.

At the Water Treatment Plant bait was only applied around buildings, water tanks, gardens and along footpath edges. The paddock adjacent to the Revital site was treated in a grid fashion.

It took 100 person hours to treat 12 ha using 162 tubes of bait. This equates to 13.5 tubes of bait per hectare and approximately 8.3 person hours per hectare.

Despite prior notification to all affected parties problems were encountered on the day and throughout the control programme that could have influenced the effectiveness of the programme and the results from monitoring, including:

- Road construction underway along southern fence line of the TrustPower site on the day bait was laid. This would have lowered the number of ants foraging in this area and cause nests to scatter, leading to insufficient recruitment of the bait.

- Large-scale construction at the Water Treatment Plant which meant that large areas at this site could not be treated.

- Removal and transportation of vegetation from the drainage ditch along the boundary of the paddock adjacent to the current composting operation. The debris was then deposited further into the paddock possibly shifting or scattering surviving nests closer to the (currently) Argentine ant free composting site.

- Spot weed spraying had been carried out at the Water Treatment Plant on the day the bait was laid (Argentine ants are unlikely to take bait where a chemical has been applied).

Figure 3.1 Total area to undergo Argentine ant control within the Te Maunga infestation January 2006.

Chapter 4: Results

4.1 TrustPower

A total of 23 bait vials were placed at the TrustPower site. The number of vials that recorded positive for Argentine ants reduced from 12 vials to 4 vials over a 78-day period (Figure 4.2). This equated to an 88.1% reduction in the actual number of Argentine ants recorded at this site (Figure 4.1).

Visual searching and observation during post-treatment monitoring did however show that there were still strong trails of ants running along the western and southern fence lines adjacent to the untreated infestation areas. Argentine ants were also found at sampling station 22 (border between residential homes and Tenix) which had previously recorded as negative for the ant during pre-treatment monitoring (Figure 4.1).

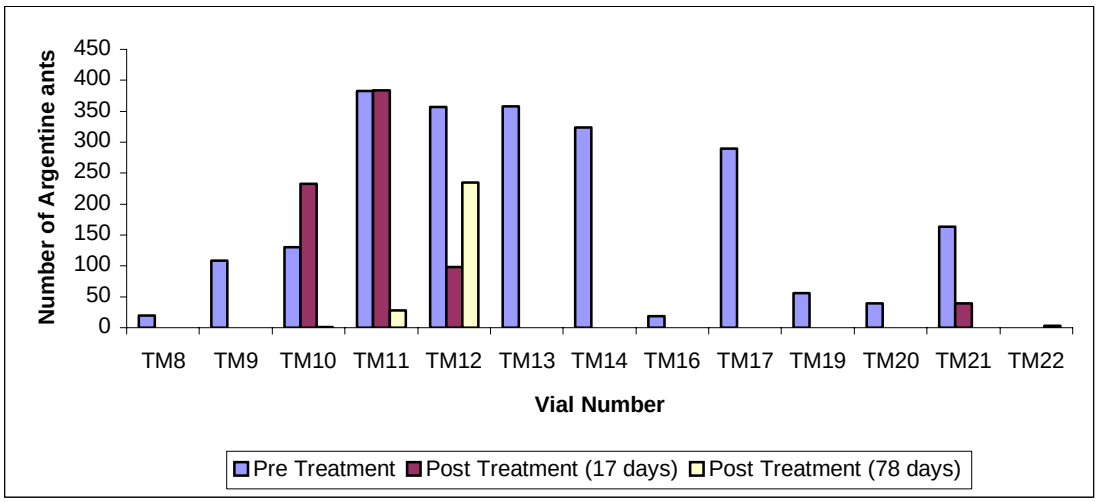

Figure 4.1 Number of Argentine ants recorded at sampling stations 5-days pre-treatment, 17 days post-treatment and 78 days post-treatment at the TrustPower site.

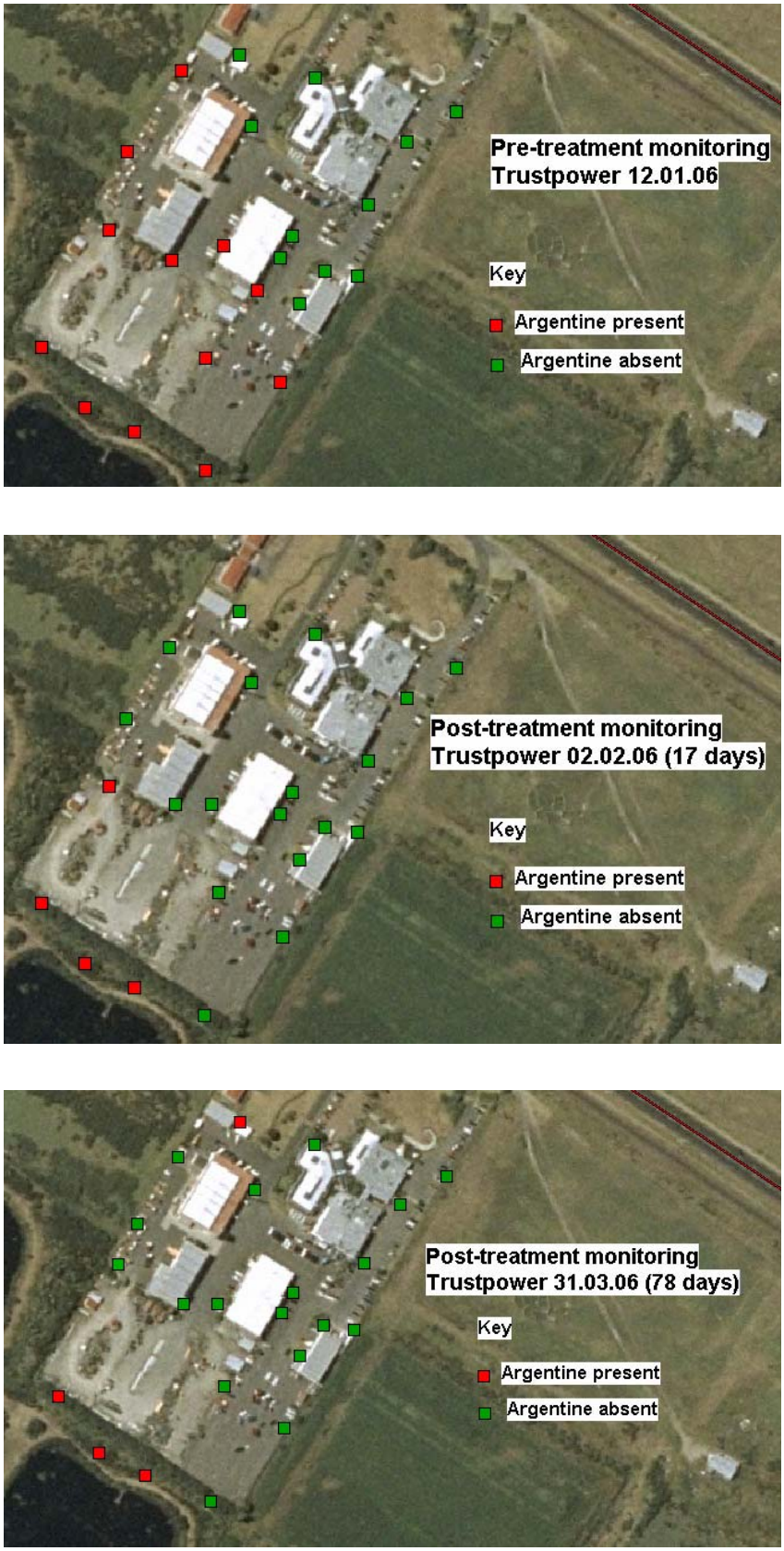

Figure 4.2 Argentine ant presence and absence at the TrustPower site pre and post treatment.

4.2 Transfer Station

A total of seven bait vials were placed at this site. All vials recorded negative for Argentine ants during monitoring conducted 78 days after treatment (Figure 4.3). Ants were however observed in low numbers at the gate leading to the adjacent paddock used to as a holding facility for recyclable material.

Figure 4.3 Argentine ant presence and absence at the Transfer Station pre and post treatment.

4.3 Revital Composting

A total of 19 bait vials were placed at this site. Six vials recorded positive for Argentine ants during pre-treatment. Possible bias due to disturbance during the removal of vegetation and topsoil along the drainage ditch bordering this paddock meant that the site was not re-monitored until 31 March 2006 (78 days post treatment). Eight extra vials were therefore placed to measure the possibility of nests scattering during the removal of the vegetation.

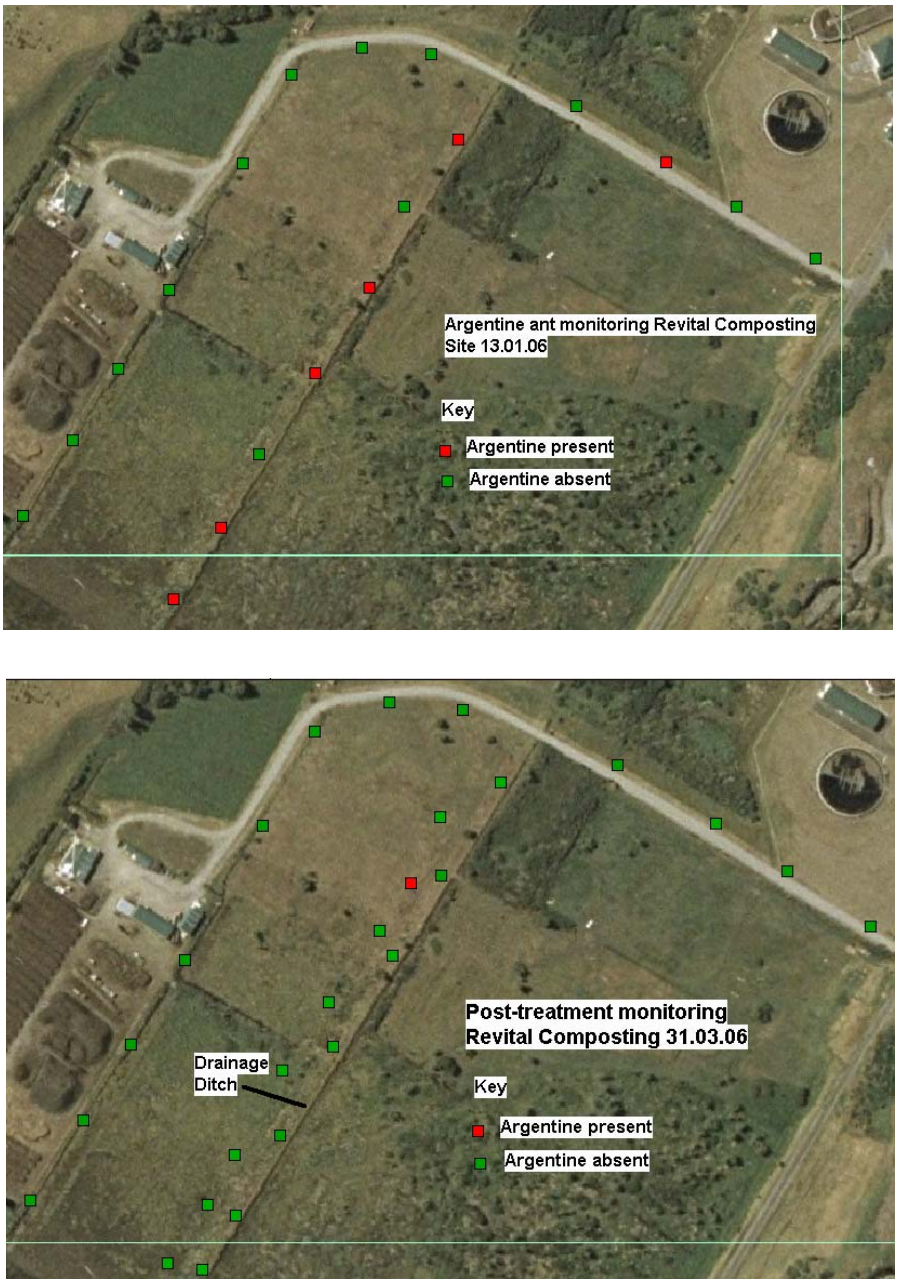

Figure 4.4 Argentine ant presence/absence at Revital Composting pre and post treatment.

Chapter 5: Cost of Control

Table 5.1 Itemised costing of the Argentine ant Control Programme Te Maunga January 2006 (includes GST).

Item	Amount	Cost
Xstinguish Argentine Ant Bait	162 tubes (@ 325g)	6,764
Labour	100 hours	4,500
Monitoring vials and paste	100 vials 1 tube (@ 326g) of paste	100
Labour (Environment Bay of Plenty staff x2)		800
Total cost		**$12,164**

Chapter 6: Conclusions and Recommendations

- Environment Bay of Plenty is currently consulting with Biosecurity New Zealand about the appropriate future management of Argentine ants within this site.

- As the entire area of the infestation is not under treatment and as the site is high risk in terms of re-infestation from transported material from outside the area it is highly probable that control will be an ongoing requirement.

- However, any future control programme would have to be on a trial basis due to the unique and problematic nature of this site. Although the preliminary results of the recent treatment programme are promising, due to the lack of information on rates of re-infestation further monitoring is required before the effectiveness of this level of control at this site can be truly measured. It is therefore recommended that the current monitoring programme be continued, with three-monthly monitoring until December 2006. It should also be noted that monitoring becomes less sensitive as the population size decreases, which could cloud initial treatment results.

- Increasing the control area to include a 50-metre buffer around each business equates to an extra 15 ha of land to be treated. There are issues of accessibility into this buffer area due to the nature of the habitat and in some cases hand application of the bait would not be possible. The use of Ant Stop G (Appendix I) as a toxic barrier between the ants and the industries could be an option, however the product information available is for small urban application only. Further consultation with Vivian Van Dyke (Bait Technology Limited) is recommended to ascertain the implications of applying the product in large quantities in the type of ecologically sensitive habitat that is found within the boundaries of the control area.

- The Biosecurity New Zealand website recommends re-baiting Argentine ant affected land within 6-8 weeks post-treatment and a quarantine area for the transporting of goods on or off affected land. Implementation of these options could possibly increase the time period between repeat control operations. It is recommended that these options be investigated.

- Currently, Argentine ants are regularly being transported to the Te Maunga green waste site from infested city gardens. Environment Bay of Plenty will undertake to work with Tauranga City Council towards a full monitoring/surveillance regime of council-owned nurseries and city parks/gardens/reserves. Statutory obligations under Section 52 of the Biosecurity Act (1993) state that: “No person shall knowingly communicate, cause to be communicated, release, or cause to be released, or otherwise spread any pest or unwanted organism”.

- Environment Bay of Plenty will undertake to work with Tauranga City Council towards a ratepayer/public education programme to prevent ant-infested soil and green waste being transported to Te Maunga from known areas of Argentine ant infestations.

- Mangatawa/Papamoa Maori block landowners have not been fully consulted about the issue. There are plans to develop their land at Te Maunga into an industrial park within the next
  2-3 years. This is likely to involve soil disturbance. The landowners have indicated that they would like to be included in any future control programmes and may be prepared to contribute to the associated costs of control. It is recommended that Mangatawa/Papamoa Maori land be included in future control programmes in consultation with iwi, prior to any development of the land.

- Landowners/administrators should consult with Environment Bay of Plenty prior to expanding any current operations or carrying out any developments within this site. All developments will have to be able to mitigate the potential risks of spreading the ant from this site.

- If acceptable mitigations to the potential risks of spreading Argentine ants from this site cannot be implemented, Environment Bay of Plenty could declare the site to be a Restricted Place under Section 130 of the Biosecurity Act (1993) in order to prevent the spread of Argentine ants to other unaffected sites.

- All staff working regularly within the site should be made aware of the risks of transportation of the ant offsite in equipment, on goods and in vehicles, and receive information on how best to avoid spreading the ant.

Chapter 7: References

Harris, R.J. 2002. Potential Impact of the Argentine Ant *(Linepithema humile)* in New Zealand and Options for its Control. Wellington, N.Z.: Author.

Lester, P.J., & Longson, C.G. 2002. Argentine Ant Distribution Investigations: Horticultural Areas. Wellington, N.Z.: MAF Biosecurity Authority.

Ward, D.F., & Harris, R.J. 2005. Invasibility of native habitats by Argentine Ants, Linepithema humile, in New Zealand. New Zealand Journal of Ecology.

Appendices

Appendix I – Ant Stop G Material Safety Data Sheet

environmental
HEALTH PRODUCTS

PO Box 100287, NSMC, Auckland, New Zealand
Ph: (09) 489 7090 Fax: (09) 489 7091

Material Safety Data Sheet
Date of Issue: 20 June 2002 Page 01 of 02

PRODUCT NAME:	**ANT STOP G**	
IDENTIFICATION		
Other Names:	Chlorpyrifos G	
Use:	A granular insecticide for the control of various pests in turf, gardens and other outdoor areas.	
UN Number:	N/A	
Class:	N/A	
Hazchem Code:	N/A	
Poisons Schedule:	5	
Physical Description/Properties		
Appearance:	A tan coloured granule	
Flash Point (°C):	N/A	
Boiling Point (°C):	N/A	
Flammability Limits (%):	N/A	
Vapour Pressure:	N/A	
Solubility in Water (g/L):	Insoluble	
Specific Gravity:	1.1g/mL (bulk density)	
Ingredients		
Chemical Entity	CAS Number	Proportion
Chlorpyrifos	2921-88-2	50g/Kg
Petroleum Solvents	63231-51-6 & 64742-4-8	<50g/Kg
Emulsifiers and inerts		900g/Kg

HEALTH HAZARD INFORMATION

Health Effects:

Acute

Chlorpyrifos is an organo-phosphate insecticide and will inhibit cholineesterase. Symptoms of overexposure to the active constituent may include headaches, dizziness, incoordination, muscle twitching, tremors, nausea, abdominal cramps, diarrhoea, sweating, constrictive pupils, blurred vision, salivation, tightness of the chest, excessive urination and convulsions.

Swallowed

The acute oral toxicity of the active constituent is high with reported LD_{50} measurements for the active at 115mg/Kg. Because of the low levels of active constituent in this product the risk of serious poisoning by ingestion is low.

Eyes

May irritate eyes.

Skin

The acute dermal toxicity for the active constituent is low and the formulation makes the risk of poisoning by this route very small. The product may cause some skin irritation after prolonged contact and will irritate broken skin.

Inhaled

The risk of poisoning by dust inhalation is low but the dust will irritate the mucous membranes and cause sinuous discomfort. Prolonged exposure to the product may cause headaches and other discomfort as a result of the presence of petroleum solvents.

Chronic

Rats and mice that were administered the active ingredient in long term studies showed no increase in tumours compared to the control. Studies in rats and rabbits indicate that the active constituent does not cause birth defects or infere with reproduction. There is no known evidence of genetic change or accumulation of the active constituent in the body.

First Aid:

Swallowed

If swallowed contact a doctor or the National Poisons Centre (0800 764 766)

Eyes

If in eyes hold eyelids open, flood with water for at least 15 minutes and see a doctor if irritation persists.

Skin

Wash skin with soap and water.

Inhaled

Remove victim to fresh air and seek medical advice if effects persist. If breathing difficulties become acute give oxygen.

Advice to Doctor:

Chlorpyrifos is a cholinesterase inhibitor. Atropine by injection or Atrovent/ipratropium by airway puffs are the desirable antidotes. Oximes such as 2 PAM/protopam may be therapeutic if used early but only in conjunction with atropine.

PRECAUTIONS FOR USE

Exposure Standards:

Time weighted average for chlorpyrifos is 0.2 mg/m3. Exposure standards for nuisance dusts should also be observed.

Engineering Controls:

Use only in well ventilated areas.

Personal Protection:

When using the product wear rubber gloves. Avoid breathing dust by using an appropriate dust mask. Wash hands after use.

Flammability:

Product is not highly flammable although the small amount of petroleum solvent will support short-term combustion.

SAFE HANDLING INFORMATION
Storage and Transport: Store in a cool dry place in sealed original containers away from direct sunlight. Store away from food, feed or any items intended for human or animal consumption. Keep out of reach of children. Product is not classified as a dangerous good under current transport regulations. **Spills and Disposal:** Spills should be swept or vacuumed. Avoid breathing dust. Personal protective equipment as outlined above should be utilised in cleaning up all spills. The best method of disposal of spills is to use the product in accordance with the label directions. If this is not possible dispose of at an appropriate local authority landfill. **Fire/Explosion Hazard:** If involved in a fire the product may emit potentially harmful gases. Fire fighters should wear appropriate breathing apparatus and all non-essential personal should be kept downwind.
OTHER INFORMATION
Chlorpyrifos is toxic to birds, fish and bees. The product should be irrigated immediately after use to move the granules from the surface to reduce the risk of poisoning to foraging birds. Do not apply in any manner that may result in the granules washing into waterways. Chlorpyrifos does not bioaccumulate in animal systems.
NOTICE: Information for this product is believed to be reliable, however buyer and user assume all risk of use, handling and storage whether in accordance with directions or not. Environmental Health Products and its agents give no guarantee or warranty of any kind expressed or implied concerning the use of this product and will not accept any responsibility whatsoever whether in contract or tort for any loss including consequential loss arising out of the use of this product or caused by this product