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ARGENTINE ANT CONTROL IN WESTERN AUSTRALIA:

Considerations for Treatment of Herdsman Lake

1. History:

The Argentine ant, Iridomyrmex humilis (Mayr) is generally regarded as the most serious ant pest in the world. As the name suggests they are native to the South American sub continent, specifically Argentina and Brazil.

They were first recorded in New Orleans, America in 1891 and currently infest thousands of square miles in the Southern States. They were positively identified from Capetown, South Africa in 1908 and later from Europe.

The first recording of I. humilis in Australia was from Melbourne in 1939. In 1941 they were identified from Albany and Perth, Western Australia. They have since been found in New South Wales, South Australia, Tasmania and the Australian Capital Territory.

Following the discovery of the Argentine ant in Western Australia, quarantine and other control procedures were enforced under the Plant Diseases Act administered by the Department of Agriculture. In 1948 the ant was included in the schedule of the Vermin Act and brought under the control of the Health Act. A joint campaign was undertaken in 1949 by the Departments of Public Health and Agriculture to control the ant.

During 1952/53 a large scale trial, involving 1 squ. mile of typical metropolitan infestation, was treated in South Perth with Chlordane to determine the feasibility of an eradication programme.

Following the success of this experiment, and due to increasing public pressure, the Government decided to form a committee to mount an Argentine Ant Eradication Campaign; this committee operated under the regulations of the Argentine Ant Act 1954, which provided for a 5 year programme in the confines of the South West Land Division. Operations were financed by a Government grant and contributions from local authorities. The programme was continued through 1959/60 under the provisions of the Argentine Ant Amendment (continuance) Act 1958.

The six year programme had involved the treating of 17,516 hectares which comprised 96.5% of known infested areas.

The provisions of the above two Acts lapsed on June 30th, 1960, and the work was continued under the Argentine Ant Act, 1959 which provided for the Argentine Ant Control Committee to continue direction of the programme with its original powers, but relieved the local authorities of financial obligations and provided for the control programme to operate on funds appropriated by Parliament for that purpose.

The committee directed a limited programme for a further 8 years.

The Argentine Ant Control Committee was disbanded in December 1968 and the programme was continued under the provisions of the Argentine Ant Act 1968 which provided for the continuance of the limited programme under the direction of the Minister for Agriculture. The programme has continued to the present time under this Act.

The current programme involves the treatment of new infestations and survivals in country and metropolitan areas.

A containment programme of known infested areas continues where the terrain or agricultural and environmental factors prevents overall treatment. This involves perimeter spraying and regular inspections.

To March 9, 1984 a total of 300 square kilometers of recorded infestations have been sprayed since the inception of the campaign in 1954. Currently approximately 587 hectares are known to exist. This is comprised of the following:

Metropolitan area:	Lake Carabooda	-	100 ha
	Herdsman Lake	-	400 ha
Other Metropolital infestations		-	61 ha
Country:	Collie	-	12 ha
	Nannup	-	10 ha
	Pemberton	-	4 ha

The lakes of Carabooda and Herdsman therefore account for approximately 85% of the total infested area known to exist in Western Australia. The treatment of Lake Carabooda should be completed by May, 1984.

Current Status of Argentine Ants within Australia:

A.C.T.: Two small infestations were found two seasons ago. Chlorpyrifos treatments were applied over the two seasons and currently no surviving populations have been discovered.

N.S.W.: Only two infestations are known to exist. One small infestation is too inaccessible on cliffs to treat. The other infestation of 30 ha is located at Lane Cove. An injunction has been served against the N.S.W. Department of Agriculture preventing treatment of this area, being part of a National Park. The New South Wales Department of Agriculture has a policy of eradication. Chlordane is the chemical in use.

Northern Territory: No Argentine ant infestations are known to exist.

Queensland: No Argentine ant infestations are known to exist.

South Australia: Argentine ants were discovered widely spread in Adelaide, five years ago. A survey at that time revealed infestations to exist throughout the Adelaide metropolitan area. The area of highest ant activity occurs about a semi-trailer freight yard. This is thought to have been the initial site of infestation with freight ex Victoria suspected.

There are no infestations known to exist in port areas, grain silos or country areas. The South Australian Department of Agriculture has adopted a policy of leaving domestic Argentine ant control to the householder.

Tasmania: Overall, approximately 110 ha of infestations are known to exist. This comprises five separate suburban infestations and two rubbish dumps. The dumps account for 80 to 90 ha. Treatment of the dumps is being left until the land fill operations cease. The chemical used for control is Chlordane. The Tasmanian Department of Agriculture has a policy of eradication.

Victoria: The bulk of the Melbourne metropolitan area (70,000 ha) is infested with Argentine ants (1980 survey). The same survey found 24 country towns also to be infested but the area was not estimated. No more recent surveys have been made.

The Victorian Department of Agriculture's policy is to contain or control Argentine ants where they pose a threat to Agriculture - e.g. Port Authority premises and orchard infestations. Domestic Argentine ant control is left to the householder.

Western Australia: Currently 587 ha of infestation are known to exist (as above).

The experiences with Argentine ants in Perth in the 1940's and early 1950's, before they were rigidly controlled, showed them to be a greater pest than they have proved to be in Victoria. The difference in pest status may have a geographical basis with the warmer States of N.S.W. and W.A. regarding their control as essential. In these States the control programmes were undertaken early in the histories of the infestation as a result of public demand.

Chemicals Used:

Dieldrin and Chlordane were the standard chemicals used initially in the programme. Heptachlor has been the sole organochlorine compound in use since 1972. This is applied at 0.5% either in a grid pattern or cover spray, depending on the terrain.

Argentine Ant Biology:

Argentine ant nests consist of queens, males and workers. A caste system amongst the workers does not exist. Argentine ants differ from other species in that a nest may contain from one to many hundreds of fertile queens. Nuptial flights are rare, mating taking place within the nest. On the ground, nests are located close to the surface, most not extending below 100 mm. However nests may be found under the bark of living trees, in tree forks and virtually any space where light is excluded. The nests tend to be located close to the food source. Also unlike other ant species, queens may forage with workers. In this way fertile queens may be easily transported away from the original infestation on floating debris in a stream or through the shifting of commodities by man. The natural rate of spread of Argentine ants is slow (approx 300 m/year) and results from foraging queens establishing new nests on the edge of existing infestations. The nests of any particular area are not discrete, there being an apparently free flow of workers between them.

The most notable feature of the Argentine ant, besides its very obvious trailing habit, is its great abundance in established areas. This results from the multiplicity of queens and the longevity of the workers. The increase of Argentine ants in a new area is not sudden but is steady and continuous. It can take several years for Argentine ants to build up in sufficient numbers to pose a real problem. However, once high numbers are attained they are maintained.

Through sheer weight of numbers all other ant species are excluded from an infested area.

Argentine ants prefer sweet foods and their natural food sources include the nectar from flowers, fruits, plant exudates and the honeydew exudates of aphids and scale insects.

In domestic situations they will readily feed on sugar, syrup, honey, fruit, fruit juices, dead insects, fresh meat, blood, lard, cream and soiled clothing.

Pest Status:

Domestic Situation:

Through high numbers and persistence Argentine ants are capable of making normal home life almost impossible to such an extent that there have been many cases of families moving out of houses in severely infested areas. Thus real estate values in infested areas are significantly depressed. The ants are capable of causing householders serious nervous irritation and annoyance detrimental to health. Argentine ants do not sting but can bite and have been recorded attacking babies and frail aged persons. Beds in infested houses require their contacts with the ground to be isolated to prevent the ants disrupting sleep.

In kitchens, Argentine ant activity can be very heavy in pantries, refrigerators, stoves and on tables and benches. Pets may also be affected and nestlings in avaries have been killed by Argentine ants.

Commercial Situation:

Any commercial enterprise dealing in food, groceries, (e.g. grocers, restaurants, delicatessens) or food storage can have their operations significantly impaired through Argentine ant activity.

Agricultural Situation:

Argentine ants feed on the exudates of aphids and scale insects and actively protect them from their natural biological control agents. Consequently these insects proliferate in areas infested with Argentine ants. The citrus industry is particularly affected through this but many other crops, from cotton to sugar cane, are at risk.

Argentine ants also directly damage flowers preventing fruit formation. Fig fruits are directly attacked.

Poultry industries can be severely hampered by direct attacks on young birds and by the ant activity affecting egg lay through disturbance of the hens.

Apiarists consider Argentine ants a major pest both via direct attacks on hives and the infesting of equipment and consequent contamination of honey.

Wildlife:

Argentine ants can drive sitting birds from the nest and attack and kill young soon after hatching, possibly initially being attracted to the remains of the egg yolk.

Trade:

Many of our major trading partners including Russia, China and Japan are free of Argentine ants and are concerned at the possibility of receiving infested cargo from Australia. The ant's ability to travel via the trade routes has been amply demonstrated. Infested shipments from Australia have been detected in New Zealand and New Guinea.

These trade considerations have been examined by Standing Committee of Agriculture. As a result, pressure has been brought to bear (in particular, Victoria) to ensure that export areas are kept free of ants and that interstate distribution is kept to a minimum. This aspect of Argentine ants was discussed by Standing Committee at its most recent meeting in Perth in February, 1984.

Need for Control:

The above domestic, commercial, agricultural and trade considerations provide sound reasons for a control/eradication progamme.

Health and environmental aspects, attributed to the application of insecticides which are not specific and have been termed biocides, appear on the debit side of such a programme. Added to this is the considerable cost of the programme.

However, cessation of control procedures would predictably lead to the following -

(i) increase in spread and severity of Argentine ant outbreaks

(ii) increase in disruption to domestic and commercial enterprises and to wildlife

(iii) increase in the quantity of pesticides applied by both householders and commercial enterprises, and

(iv) increase in public pressure for the Government to implement control procedures.

This latter point emphasises the 'negative feedback' effect that control procedures have on public opinion. The more effective the control the less people affected by Argentine ants and hence the less people interested in their control. The reverse also applies.

To date 300 square kilometres of Argentine ant infestations have been treated in W.A. and at present only 587 ha are known to exist. Of this total area 500 ha exist in Lakes Herdsman and Carabooda. At the completion of the current season, treatment of Lake Carabooda and some other infestations will be completed leaving a total of approximately 487 ha to be treated. It is conceivable that once treatment of the above lakes is completed eradication of Argentine ants in W.A. could be achieved.

2. Containment Vs Eradication - Herdsman Lake:

Containment inherently embodies an 'ad-infinitum' approach through continued long term use of persistent chemical barriers. While a physical barrier of a moat could be seen as augmenting such a containment programme, wind and water movements of floating debris could provide too many opportunities for the ants to cross the barrier for it to be used as the sole method of containment. Success of a containment policy would depend totally on its efficacy. The containment programme of chemical barriers applied yearly for the past 30 years around the perimeter of Herdsman Lake has only been effective in reducing the spread of the ant into the immediate vicinity. Public access to the lake has resulted in the transport of the ants throughout the metropolitan area through the transport of peat and through other processes.

Although nuptial flights of Argentine ants are said to be rare, reproductive males and females do possess wings and hence spread from a containment area via this means cannot be overlooked. Similarly spread of ants attached to birds cannot be discounted due to the density of the ants and the considerable bird traffic associated with the lake.

The detrimental effect of Argentine ants on wildlife within the containment area would continue 'ad infinitum' and needs to be considered in view of the lake being preserved as a wildlife sanctuary.

Consideration should also be given to the possibility of the development of resistance to insecticides by Argentine ants in containment areas where chemical barriers are used on a schedule basis. In the normal Argentine ant control programme the ants are totally eliminated from an area with one spray application with a possible spot treatment of surviving ants in the following year. The question of resistance in these circumstances does not seriously arise. However, where isolated pockets of ants in a containment area are peripherally exposed to repeated chemical applications, the risk of insecticide resistance developing is increased.

Eradication of ants in Herdsman Lake will depend on the effectiveness of the chemical used and the thoroughness with which it is applied. At present the most effective chemicals available belong to the organo-chlorine class. These have the undesirable side effects of being non-specific, able to be concentrated in the food chain and very residual. The proposed programme to eradicate Argentine ants in Herdsman Lake would require 3 years. However, this time period could possibly be reduced if necessary. Eradication would require the cover spraying of most areas with 0.5% heptachlor plus the cutting

of paths through the lake vegetation to allow access. The programme would obviously result in immediate disruption of fauna and flora with some mortality of fish, birds and other life. However, if successful, pesticide residues would decline over time leaving an area suitable for management as a fauna reserve as opposed to the 'ad infinitum' approach of a containment situation.

Concern has been raised over the entry of heptachlor into underground water reserves and this aspect also needs to be considered.

3. Possibility of Alternative Methods to Control by Organochlorine Chemicals:
There are no known biological control agents which have been proven to effectively control Argentine ants. The whole concept of biological control in any case requires a constant base strata of hosts.

An entomologist from the University of California visited the Western Australian Department of Agriculture's Argentine Ant Unit in 1976 while on a World search for biocontrol agents of Argentine Ants. Indications at that time were not promising.

Cultural Techniques:
Argentine ants are very adaptable and can thrive in habitats as diverse as swamps and sand dunes. Techniques of clearing, burning, cultivation and filling of swamps may reduce Argentine ant numbers but would also affect other wildlife. However, burning plus slashing of all the reeds followed by a complete flooding of the lake for a considerable time (Argentine ants were found to survive six weeks submersion at Guildford) may prove effective.

Chemical Control:

(a) Organochlorines:

Chemicals from this group tested for the control of Argentine ants include chlordane, DDT, dieldrin, endosulfan and heptachlor.

Endosulfan: In January 1971, 7.5 acres were sprayed in the normal manner at 2.95 lbs/acre. Initial results were encouraging but a four week post-treatment survey found so many surviving nests that the area was re-sprayed with dieldrin.

Again, on January 21, 1976, 3.5 ha at Belmont were sprayed with endosulphan. A survey three weeks later revealed many Argentine ants active and the area was sprayed with heptachlor.

Spray application of 2.0% chlordane, 0.5% dieldrin and 0.5% heptachlor proved satisfactory in Argentine ant control operations; capable of completely eliminating ants when applied in a grid pattern or cover spray. Dieldrin proved to be superior in ant control efficacy.

(b) Organophosphates:

Diazinon: A five acre area in West Perth was treated with 3.2 lb ai diazinon/acre in 1971. Ant numbers were reduced and a second similar application appeared to have eliminated the ants. Based on this success, a 10 acre Argentine ant infestation at Margaret River was treated with diazinon in March 1971. A resurvey of the area 4 1/2 weeks after spray application showed ants still dying on smooth barked trees. The area was resprayed with diazinon. In February 1972, Argentine ants were again found active in this area and were resprayed with a double concentration of diazinon. Another

survey was made at the end of April and Argentine ant activity was still apparent. Diazinon was again used to treat the infestation. Further Argentine ant activity was found in June 1973 and heptachlor was then chosen for the chemical treatment.

Chlorpyrifos: In 1975 a 12 acre Argentine ant infestation at Northam was partially sprayed with 1% chlorpyrifos. The remaining area received a heptachlor treatment. This treatment has apparently been effective.

Also in 1980, 1% chlorpyrifos was used to spray two hectares at Wanneroo. The boundaries, and all trees and posts, within this area were sprayed with 0.5% heptachlor. This combined treatment again appears to have been successful.

In 1981 a small area was treated with chlorpyrifos at Gosnells. This area subsequently required retreatments with heptachlor.

A two ha area was cover sprayed with 1% chlorpyrifos in Balcatta during January 1983. Boundary treatments of 0.5% heptachlor were used. To date this treatment appears to have been effective.

In summary, 1% chlorpyrifos cover spray treatments have been effective when backed up with 0.5% heptachlor treatments of boundaries and difficult areas. However, if used on a large scale, alternative breathing equipment will need to be found as operators have complained of headaches following spray application of chlorpyrifos. Positive pressure spray hoods may prove suitable.

Isofenphos: On March 9th, 1976 a two acre Argentine ant infestation in Mt Hawthorn was grid sprayed (3 ft grids) with 0.5% isofenphos. Application rate was 1,200 l/ha. Some phytotoxicity of kykuyu grass was observed.

An eight week post-treatment survey found Argentine ants active in only 3 locations. These areas were retreated with 0.5% heptachlor. A follow-up inspection in 1977 found no more evidence of Argentine ant activity.

Five hectares of Yanchep National Park were grid sprayed with 0.5% isofenphos in March 1982. The application rate was 420 l/ha. Trees were treated with 0.5% heptachlor. An adjoining 7 hectares was also treated with 0.5% heptachlor. Weekly post-treatment surveys up to six weeks after application revealed Argentine ants active in the isofenphos trial area. These recurrent infestations were sprayed out with 0.5% heptachlor. Again, slight phytotoxicity on grass was observed with isofenphos.

(c) Carbamates:

Propoxur: This is the only chemical from this group which has been tried. Four acres of household blocks in Hamilton Hill were sprayed with 0.5% propoxur at an average 70 gallons/acre on October 4th, 1972. A 14 day post-treatment survey discovered active ants, including queens, inside the nests and no evidence of affected or dying ants. Householders still complained of ant activity so the area was resprayed with heptachlor.

(d) Synthetic Pyrethroids:

Permethrin: In April 1983, permethrin 0.05% spray and dust applications were made to an Argentine ant infested area. Two hundred litres of the spray was applied to approximately a 1/2 hectare area. Trees were sprayed to a height of 2 metres and all loose material was turned over and sprayed.

Thirty trees were treated separately with the dust. The base plus two bands approximately 30 cm apart were treated on each tree.

Ants were immediately affected by the treatments, especially the spray. A 12 day post treatment survey showed only an estimated 20% reduction of ant activity in the sprayed area and an estimated 60% reduction in the dusted area. Ants were seen trailing through lightly powdered areas. A similar survey 20 days post-treatment showed Argentine ants to be back to their original numbers in both areas. On some trees the powder was still visible but ants were seen freely trailing through it and showing no ill effect.

(e) Baits:

Mirex: On November 23rd, 1965, 12.5 lbs of Mirex Ant Bait was broadcast on a one acre plot in Cannington. Subsequent surveys failed to discover any dead ants and none could be seen feeding on the bait. Little or no reduction in the ant population was observed over a five month period.

In another trial several isolated eucalypts with heavy Argentine ant infestations were ringed at the base with Mirex bait. Although inspections did discover several dead ants at the base of the trees no significant reduction of the ant population occurred. Mirex has been shown to be a carcinogen and is now unavailable.

Amdro Bait: The active ingredient of this bait belongs to a newly discovered group of chemicals known as the amidinohydrazones. On November 29th, 1983, 270 g of Amdro Bait (0.88% ai) was applied to two very small islands in the Canning River. A third small island was left untreated. Pitfall traps were installed to monitor the progress of the trial. Ants showed no interest in the bait and could be seen walking over it on their way to their normal food sources of scale insect exudates and flowers etc. Despite this, reduction of ant activity was achieved (Table I below). The failure of this bait (and probably that of Mirex) could basically be attributed to the unsuitability of the bait material (oil base) and not to any fault of the chemical. A better bait base would be sugar or similar material.

Supplies of the active ingredient have been requested from the U.S.A. and when they arrive further tests are planned using a more appropriate bait base.

Table I. Pitfall trap data - Andro Bait Trial

	1983					1984				
Trapping date	2/12	9/12	16/12	23/12	21/12	6/1	13/1	3/2	10/2	24/2
% Catches, Traps 1-10 (Baited)/Total Trap Catch 1-20	97.5	83.8	76.3	47.7	36.8	56.9	41.2	13.6	17.3	35.2

Proposed Experimental Work:

Further trials are proposed to more fully evaluate the potential of chlorpyrifos, isofenphos and the Amdro bait. Preliminary evaluation of the potent synthetic pyrethroid decamethrin and Lindane (pure gamma isomer B.H.C.) are also under consideration. The latter chemical is an organochlorine compound whose use in the past has been severely restricted due to its contamination with other isomers of B.H.C. However, pure gamma isomer B.H.C. does not suffer from the bio-accumulation problems of the other organochlorines and registration of this chemical in the U.S.A. has been sought for over 500 uses.

Constraints upon this work include the limited registration status of some of these chemicals and the availability of suitable trial sites. The effectiveness of the current campaign has resulted in there being very few available sites. Most remaining areas are situated on Crown Land. Delays in the treatment of Herdsman Lake with heptachlor may provide an opportunity to use some of this area for trial purposes.

The options for effective Argentine ant control at present appear limited. The requirement of a suitable chemical spray to be effective against Argentine ants and be non-residual in the environment appear to be mutually exclusive for currently known chemicals. This is because effective Argentine ant control requires a chemical which is of sufficient longevity to kill ants maturing and leaving the nest (emergers) weeks after the chemical application.

Experience has shown so far that, with chemicals other than the organo-chlorines, it is a matter of making a chemical work which is not quite suitable rather than establishing the most appropriate application technique for an effective chemical. Appendix I lists the relative toxicities of some common chemicals.

4. Traditional Control Method: As Proposed for Herdsman Lake

Most areas will require treatment with 0.5% heptachlor at an average application rate of 1,500 litres/ha (7.5 kg ai/ha). Where possible, grid spraying will be employed to reduce the amount of chemical applied. However, dense vegetation (e.g. typha beds) will require cover spraying. To facilitate the application of chemicals, parallel paths will need to be cut every 10 metres through the lake vegetation to allow entry of spray personnel and equipment.

Areas of open water will not require treatment. Critical habitats (e.g. reeds in contact with water) could receive alternative treatments with organo-phosphates or even fumigation. Both these latter have their drawbacks however. The candidate organophosphate insecticides have higher acute toxicities to a range of non-target species than does heptachlor (see Appendix II). Deaths of marron were observed following very light contamination of water with chlorpyrifos. Fumigation inherently is far more difficult and would result in the total death of all life in the area fumigated. Its one advantage would be a lack of residues. If used it would have to be done concurrently with the heptachlor application.

It is envisaged that total treatment of Herdsman Lake would take three years. This progressive treatment of the lake coupled with a sectional treatment approach would provide alternative feeding sites for the birds during spray operations. Typhae beds could be burnt prior to insecticide application thus rendering them less attractive to some species and consequently reducing those species' contact with the insecticide. Use could be made of automatic 'carbide guns', antifeedants or similar strategem to prevent birds feeding in treated areas. Most wildlife deaths in such situtions are due to the animals gaining access to very recently sprayed areas. Birds feeding on frogs and insects are particularly susceptible as they tend to feed on prey either killed or dying from insecticide contact as this is more readily available. Artificial feeding may reduce the risk of poisoning, for some species at least. The Committee could contribute to this part of the exercise.

Experience with the eradication of Argentine ants from other lakes in the metropolitan area has shown there to be relatively few bird deaths resulting from the operations. Rangers at Monger's Lake reported that bird deaths did not appear to be significantly higher following the treatment of that lake with heptachlor for Argentine ants. Most of the wetlands of metropolitan Perth have had Argentine ant treatments during the 30 year duration of the programme. Amongst these the prominent are Mongers Lake, Perry Lakes, Lake Claremont, Shenton Park Lake, Kent Street Islands and the foreshore areas of the Canning and Swan Rivers (Caversham to North Fremantle). Of the outlying areas the following lakes have received treatment - Mindaie, Carabooda, Pinjar, Neerabup, Joonadalup, Goollelal, Gweelup, Coogee, Munster and Jack Adder.

The low avian toxicity of heptachlor to some species (eg LD50 Mallard duck 2000 mg/kg) has contributed to the confidence with which treatment of these wetlands has been approached; invariably under the scrutiny of interested parties and the press.

5. Consequences of Such Action:

As eradication treatments, similar to the one proposed for Herdsman Lake, have been completed and are under way in various lakes within the metropolitan area, an opportunity exists for more accurately predicting the effect of the treatment on Herdsman Lake by closely monitoring the ecology of these other lakes. Useful and informative residue data from water, weed, plankton and animal samples can be obtained for current practices in use. The varying times since treatment of the lakes would give an indication of residue decline and time based environmental effects.

The relevance of this local information to the Herdsman situation could be invaluable.

6. Possible Alternatives - Including Overall Management and Urgency:

As in (3) above, levee banks could be constructed, all reeds slashed and the whole area flooded for a considerable time. Alternatively, the lake could be drained for the duration of the programme. This would require the treatment with heptachlor of a greater area but would ensure the safety of the lake birdlife which would, of necessity, leave Herdsman Lake for other wetlands.

Some advantage may be able to be taken from the periodic burns conducted under the existing management system. Substantial areas could be freed from ants if these areas were treated with heptachlor following the burning regime. This would result in a minimal disturbance to wildlife. The areas could be strategically chosen by the committee.

Plans currently exist for some 180 hectares of the total infested area to be filled and reclaimed in the next three years. It would therefore be advantageous to integrate the Argentine Ant Programme with these land-fill operations. This would involve leaving treatment of these areas until work is completed resulting in a much reduced chemical application and a substantial cost saving based on an estimated $1,000/ha for treatment of the lake.

Initially, treatment of a 50 ha area surrounding the proposed World Wildlife Fund Observation Building is envisaged. Progressive treatment of filled areas will be undertaken where necessary. However, provision for retreatment of these areas must be made as re-infestation will occur because the activity of heptachlor after 3 months will not be sufficient to prevent the re-entry of the ants.

With the planned completion of eradication programmes at Lake Neerabup (1984) and Lake Carabooda (1984/85), Herdsman Lake will be the last remaining infestation of any size within the metropolitan area. Removal of peat from the lake is seen as a major source of spread of Argentine ants. Such activity is readily observable on week-ends with one common access being through the rear of the Herdsman Hotel Parking area. The previous licensee, Mr Peter Birchett complained of this activity.

A new infestation, involving 80 locations (11 ha), has recently been discovered in Wembley (bounded by Hale, Valencia, Faulkner and Buntyne Streets). Information gained from a house to house doorknock of the area revealed the most likely source of the infestation to be peat collected from Herdsman Lake.

Consideration, therefore, should be given to the quarantining of the area under the appropriate provisions of the Agricultural and Related Resources Protection Act.

7. Recommendation:

The Department of Agriculture endorses the Committee's recommendation that the Government urgently proceeds with the preparation of a Management Plan for Herdsman Lake and that this Management Plan incorporates an Argentine Ant Eradication Programme.

Appendix I: Relative toxicities of common chemicals

(From Worthing C.R. (Ed) - "The Pesticide Manual - 6th Edition". British Crop Protection Council, 1979

Chemical Name	Trade Name	Oral LD50 mg/kg Rates	Dermal LD50 mg/kg Rates	Comments
Aldicarb	Temik	0.93	5.0	
Amidinohydrazone	Amdro	1131	> 5,000 (rabbits)	Toxic to fish
Aspirin	Aspirin	750		
Azinphos-ethyl	Gusathion	12.5 - 17.5	250	
Borax	Borax	4,500-6,000		Lethal dose human infant 5-6 g
Chlordane	Chlordane	375		
Chlorpyrifos	Lorsban	135 - 163	2,000 (rabbits)	Toxic to shrimps & fish
2,4-D	275			
D.D.T.	D.D.T.	113 - 118	2,510	
Decamethrin	Decis	134	> 2,000 (rabbits)	
Demeton-s-methyl	Metasyatox	57 - 106	302	
Diazinon	Gesapon	300 - 850	> 2,150	Highly toxic to birds & bees. Toxic to fish.
Dieldrin	Dieldrin	46	10 - 102	Toxic to fish
Dimethoate	Rogor	320 - 380		
Fenamiphos	Nemacur	15.3 - 19.4	500	
Fenthion	Lebaycid	190 - 315	330 - 500	
Glyphosate	Round-up	43230	> 7,940	
Heptachlor	Heptachlor	100 - 162	195 - 250	
Isofenphos	Oftanol	28 - 38.7		
Maldison	Malathion	2,800	4,100 (rabbits)	
Methiocarb	Mesurol	100	350 - 400	
Methonyl	Lannate	17 - 24	> 5,000 (rabbits)	
Mevinphos	Phosdrin	3 - 12	< 5,000	
Mirex	Mirex	306	800 (rabbits)	low toxicity to birds, fish crustaceans
Naled	Dibrom	430	1,100 (rabbits)	
Parathion	Parathion	13	21	
Permethrin	Ambush	430 -4,000		
Phorate	Thimet	1.6 - 3.7	2.5 - 6.2	
Propoxur	Baygon	90 - 128	800 - 1000	
Temephoas				
Temephos	Abate	8,600	> 4,000	
Trichlorfon	Dipterex	560 - 630	> 2,000	

Appendix II: Toxicity of candidate materials to non-target organisms

(From McEven, F.L., Stephenson, G.R. - "The Use and Significance of Pesticides in the Environment". John Wiley and Sons, 1979)

Chemical name	L.D. 50 mg/kg Birds	L.C. 50 ppb Crustaceans	L.C. 50 ppb Fish	Effect on Phyto-planton %	Persistence* in natural water
Chlordane	1200 (Mallard)	29 (Daphnia) - 160 (Gammarus)	10 (Trout)	-94	c
Dieldrin	48 (Sparrow) - 381 (Mallard)	250 (Daphnia) - 1400 (Gammarus)	3.4 - 19.7	-85	d
Heptachlor	2,000 (Mallard)	42 (Daphnia) - 150 (Gammarus)	3 (Bass) - 230 (Goldfish)	-94	d
Chlorpyrifos	13 (Pheasant) - 75 (Mallard)	0.76 (Gammarus)	0.58 (Bass) - 20 (Trout)		a
Diazinon	3.5 (Mallard) - 4.3 (Pheasant)	0.9 (Daphnia) - 800 (Gammarus)	52		b
Allethrin	2,000 (Malard)	21 (Daphnia) - 20 (Gammarus)	19		
Isofenphos	5 (Quail) - 21 (Chicken)		1,000-2,000		

* Persistence classes (a) Half life less than 2 weeks
(b) Half life 2-6 weeks
(c) Half life 6 weeks - 6 months
(d) Half life more than 6 months

APPENDIX III

PART BIBLIOGRAPHY : IRIDOMYRMEX HUMILIS (MAYR)

Includes Biology, Pest Status and Control Methods

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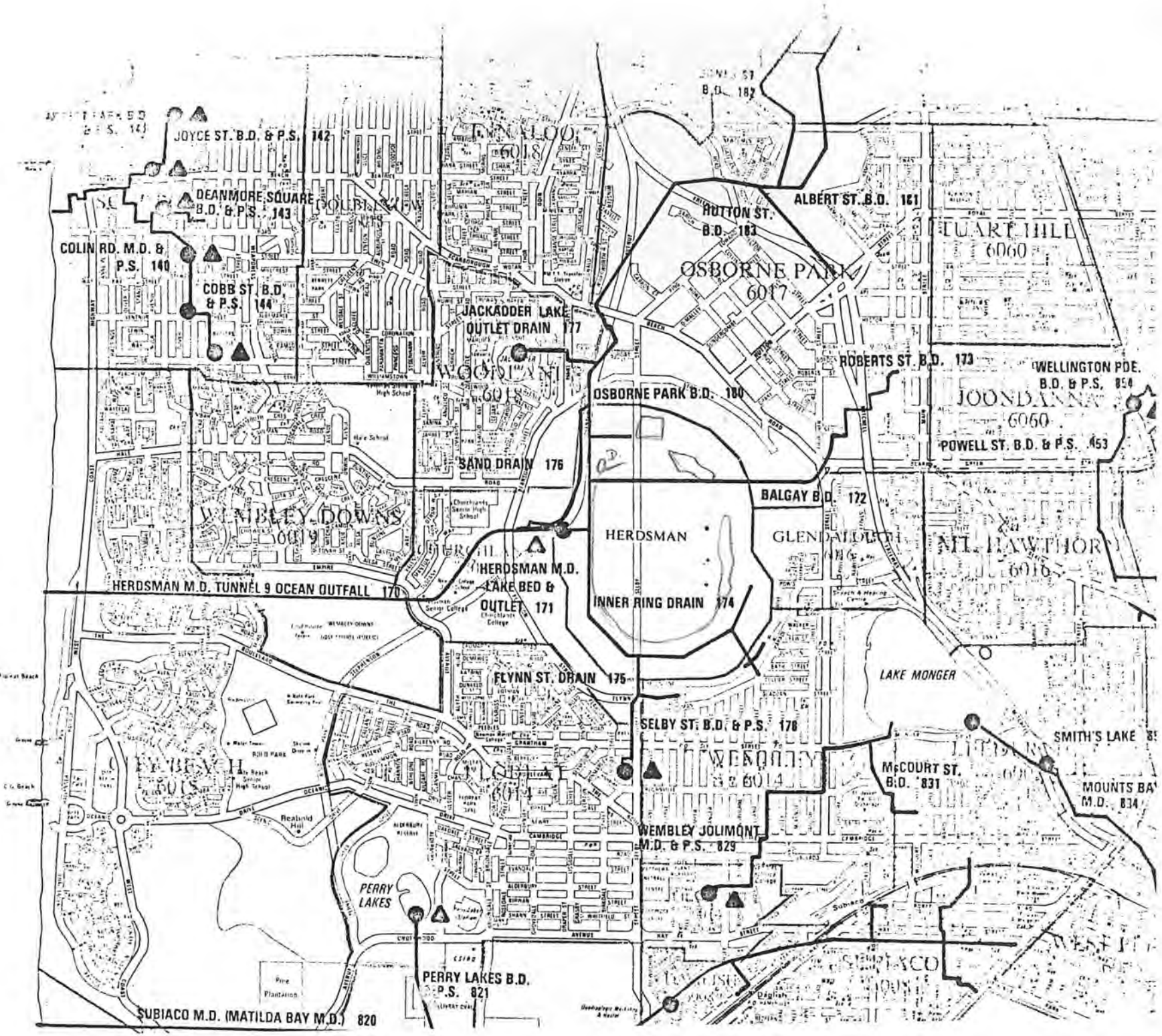
APPENDIX IV


JOYCE ST. B.D. & P.S. 142
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COLIN RD. M.D. & P.S. 140
COBB ST. B.D. & P.S. 144
JACKADDER LAKE OUTLET DRAIN 177
OSBORNE PARK B.D. 180
SAND DRAIN 176
HERDSMAN M.D. TUNNEL 9 OCEAN OUTFALL 170
HERDSMAN M.D. LAKE BED & OUTLET 171
INNER RING DRAIN 174
FLYNN ST. DRAIN 175
SELBY ST. B.D. & P.S. 178
WEMBLEY JOLIMONT M.D. & P.S. 829
PERRY LAKES B.D. P.S. 821
SUBIACO M.D. (MATILDA BAY M.D.) 820
HUTTON ST. B.D. 183
ALBERT ST. B.D. 161
ROBERTS ST. B.D. 173
WELLINGTON DOE. B.D. & P.S. 850
POWELL ST. B.D. & P.S. 453
BALGAY B.D. 172
McCOURT ST. B.D. 831
SMITH'S LAKE
MOUNTS BAY M.D. 834
LAKE MONGER
HERDSMAN
PERRY LAKES
OSBORNE PARK
6017
JOONDANNA
6060
WEMBLEY DOWNS
6019
MT. HAWTHORN
6016
WOODLANDS
6014
SUBIACO
6008