

THE DAMAGE CAUSED  
BY RED-TAILED BLACK-COCKATOOS  
*(Calyptorhynchus banksii)*  
ON PEANUT AND OTHER CROPS  
WITHIN THE FARMING DISTRICT  
OF LAKELAND DOWNS  
CAPE YORK PENINSULA

FEBRUARY 1998

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## 1. INTRODUCTION

On 13 March 1997 a meeting was held at Lakeland Downs State Emergency Service building with Lakeland Downs farmers and Department of Environment representatives. The purpose of the meeting was to discuss the damage caused to various crops within the farming district of Lakeland Downs by Red-tailed Black-Cockatoos. The majority of the discussions centered on damage to peanut crops. Additionally, deterrent methods were heavily debated as were estimates of crop damage, loss of yield, cost of deterring cockatoos and associated lost revenue in general.

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Plate 1. Peanut damage, south-eastern corner paddock, 7B aggregation. As is the case in most damaged sites throughout the district, cockatoos have worked in from the edge. Their feeding technique is such that total destruction is caused to the crop where birds have been active.

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Out of these discussions the farmers were assured that the Department would investigate the nature, extent and severity of the problem, assess the effectiveness of current bird control methods, and assess the introduction of a relatively new bird deterrent system, supplied on hire and manufactured by a southern Queensland company.

With farmers concurrence, it was agreed that Departmental staff would be required on site during the growing phase of the peanut crop, through to harvesting and beyond to collect sufficient data to assist farmers and the Department in resolving the long standing seasonal problem of crop damage by Red-tailed Black-Cockatoos.

Damage Mitigation Permits were issued to farmers who could demonstrate a genuine reason for obtaining such permits for the species Red-tailed Black-Cockatoo, Sulphur-crested Cockatoo and Agile Wallaby. Monitoring of permits and permit conditions was carried out during the study period.

Five Damage Mitigation Permits were issued and farmers who received permits were: Inderbitzin, Hosking, Ahlers, Anderson and Green. A total of 30 Red-tailed Black-Cockatoos were allowed to be shot dead under each permit which was a grand total of 150 birds. Permits were valid for a period of four months from March to July, **a total of only 4 Red-tailed Black-Cockatoos were shot dead up until commencement of harvest at the end of May which was also the conclusion of my study period.** However, since May a further 21 Red-tailed Black cockatoos have been reported shot. This action was borne out of frustration as all farmers agreed that they did not want to shoot any birds but felt compelled at the time because of damage being caused. Perhaps birds were shot just for the psychological relief it gave to feel that something was being achieved. All farmers agree that shooting the cockatoos does not solve the problem of crop damage and are at a loss as to what alternative methods are effective in deterring the birds, as many methods have been tried.

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Plate 2. Damaged crop, south western corner paddock. Approximately 4 acres were damaged pre-harvest.

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According to farmers, the problem with the cockatoos is a relatively new one. Apparently the birds were self-taught (severing the peanut shrub above ground level and then pulling the peanuts out of the ground by the stems, meticulously shelling the casing and retrieving the nut) and it was not until a few years ago, (possibly ten - varied information from farmers) that the cockatoos began to feed on the peanut crops.

Approximately 2000 Red-tailed Black-Cockatoos were active during the study period within the farming district of Lakeland Downs. Numbers of 3000 to 5000 birds, and increasing, as suggested by the farmers is clearly more a perception than a reality. The tendency of farmers to exaggerate bird numbers and bird damage is attributed to the very high visual impact when birds are in flight, being a large bird species and of their "mowing" to bare ground method of feeding. It was common, when in company with farmers and farm staff, to hear of a number of birds feeding in a particular area to be in excess of 1000. Upon arrival in the area, a quick count would reveal no more than a few hundred birds. The visual effect was highlighted even

further when birds had taken flight with raucous alarm calls. When confronted with such a spectacle it is understandable that farmers believe that there are thousands of birds causing untold damage. With regards to crop damage, again the visual impact is such that farmers have a tendency to exaggerate and it is not until ground truthing is carried out that the actual damage is determined. The damage is usually much less than anticipated. Plates 1 & 2 graphically illustrate crop damage.

Claims by farmers of an increase in the bird's population are not substantiated. The abundance of an easily accessible food source may have altered the feeding habits of local populations to such an extent that birds are present all year round. According to farmers, the birds are able to maintain an existence on the residual nuts after harvest. Certainly a continuous yearly supply of nuts are available, borne out by the fact that the harvesting techniques are such that a proportion of peanuts are discarded onto the surface and subsurface. An increase in numbers of hundreds to many thousands of birds over a period of a few years, as claimed by some farmers, requires quantification and is perhaps more perception than reality. While food may be plentiful, population growth is more likely to be limited by availability of nesting hollows and the species breeding biology, none of which have been investigated in this area. Elsewhere Red-Tailed Black Cockatoos produce at most one young per year with the main factor controlling the population size being nest predation. Cockatoos are a common sight, and are classified as "common" throughout northern and interior Australia. While driving up the Peninsula Development road through Cape York Peninsula, cockatoos are ever present and one can conclude that local populations would have inhabited the area, before development of the farming district. If numbers have increased it is probably because pairs from a wide area have concentrated in the Lakeland district.

## 2. EXPLANATORY NOTES:

Red-tailed Black-Cockatoos will be referred to in the report as either; bird, birds, bird species, cockatoo or cockatoos. Other bird species will be referred to by their full common name.

"Home Paddock" are two peanut paddocks next to the Inderbitzin residence (locality map 4).

"Test Site Paddock" is a peanut paddock located near Honey Dam (locality map 3).

"7B paddock" general and paddocks within 7B, aggregation, e.g.; Residual Paddock, Cow Pea Paddock, South West Corner Paddock, Triangular Paddock and South East Corner Paddock (locality map 2).

All of the above paddocks (locality map 1) are farmed and owned by Mr Peter Inderbitzin, sowed with peanuts and have all sustained damage caused by Red-tailed Black-Cockatoos.

"Residual Paddock" is the paddock where old peanuts left over from last years' harvest have regenerated. This particular paddock was ploughed and seeded with *Brachiaria* grass for seed production and peanuts emerged in conjunction with grass.

"Cow Pea Paddock" is adjacent to Residual Paddock and residual peanuts had emerged providing a substantial covering of peanuts. In the latter phase of the study period this paddock was ploughed and seeded with Cow Pea. After ploughing, a proportion of peanuts were unearthed. Both paddocks are within the circumference of a pivot irrigator, a total area of approximately 200 acres. At the beginning of the study period both paddocks were heavily targeted by the cockatoos. Mr Inderbitzin was happy to leave the birds undisturbed in these two paddocks, utilising the paddocks as sacrificial crops.

"Eight Mile" is a site, from the end of the bitumen at Lakeland Downs, along the Lakeland/Laura road for approximately 20.7 kilometres to an observation point across the Laura Valley. It is in open woodland adjacent to the Peninsula Development Road on the left beyond a cleared area and is a favoured roosting site of Red-tailed Black-Cockatoos.

According to farmers, this roosting site has been favoured by the birds for a number of years. Refer locality map 5.

### 3. METHODS

#### Quotas

Areas under peanut cultivation were obtained from the farmers who sustained crop damage by Red-tailed Black-Cockatoos. Four farmers were exempt from the study apart from information gathered on localised cockatoo behaviour and history.

Farmers who obtained Damage Mitigation Permits generally volunteered the size of their area under peanut cultivation. Ground truthing was necessary to establish a conservative estimate of area sowed with peanuts. This was achieved by measuring the paddocks by vehicle odometer and pivot irrigator radius. The following areas were sown in peanuts:

- Inderbitzin's had sowed approximately 700 acres in peanuts.
- Jeffery Anderson advised that he planted approximately 360 acres in peanuts.
- The Hosking's advised that no damage was sustained, consequently no quotas were obtained.
- The remaining farmers; Steve Ahlers and Graham Green did not plant peanuts.

#### Farmer liaison

Observations commenced on Wednesday 19 March 1997. Farmers who applied for Damage Mitigation Permits were contacted and through general conversation, information was gathered on crop damage, bird numbers and bird behaviour.

Barry and Darren Hosking advised that they had no damage to crops by cockatoos, although two birds were shot within the sorghum paddocks. Barry advised that they had experienced crop damage from wild pigs rather than any damage connected to cockatoos.

Jeffery Anderson advised that he sustained little, if any, crop damage from cockatoos. He said that there was some bird activity, mainly from sulphur-crested cockatoos but was not overly concerned. He managed to keep birds from alighting onto his crop by driving around harassing the birds during the morning and evening periods when they were most active. He said he continued this harassment method until completion of harvest.

Steve Ahlers advised that sulphur-crested cockatoos have been a problem in the past in his maize corps. He has had to deal with the problem again this season. Damage occurs on the eastern extremity of his paddock adjacent to open woodland. Although he expressed no real concern for the damage sustained, he mentioned putting "a couple of shots over their heads to lift them" but not to shoot the birds. Mr Ahlers planted only maize this year.

Graham Green was unable to be contacted during the study period. Many attempts were made, but by no fault of persons concerned, paths did not cross. Information from other farmers in the district and from ground-truthing was sufficient for the overall study.

Peter and Franziska Inderbitzin have by far sustained the majority, if not all, of the damage to peanut crops by Red-tailed Black cockatoos. It is understandable, that the Inderbitzin's have been quite vocal in venting their frustrations over the cockatoo problem. Mr Inderbitzin has repeatedly stated throughout the study period that he would prefer to see total eradication of the cockatoos. In response, the Department of Environment has advised Mr Inderbitzin that no such stance will be tolerated or undertaken by the Department under the current legislation and that deterring the birds is the only permissible course of action. For this reason, constant

liaison was critical in maintaining a harmonious working relationship with the Inderbitzin's. (Refer BirDeter system page 9 and sound system trials complete page 13).

### Bird behaviour/observations

Farmers believe that bird numbers have increased and that birds are breeding locally. Numbers in excess of 5000 were reported to be active within the district. The validity of such statements are questionable and it would require a complete study of the species' ecology to prove or disprove any claim of local population numbers, breeding activity and migratory patterns. Farmers differ in the numbers they allege are present this season (approximately 2000 birds here counted during the study period).

Ground truthing of damaged peanut crops, bird numbers and bird behaviour was carried out within the Lakeland Downs farming district. To study bird behaviour it was necessary to commence observations pre-sunrise and it was found that approximately 5.30 am onwards was an ideal time to monitor and count birds at roost and pre-feeding and to monitor local movements and peanut paddocks targeted at first feed. Monitoring from approximately 4 pm until night fall (usually 7 pm) established targeted feeding sites, movement patterns to roosting sites, last feed behaviour and bird numbers. During the remainder of the day assessments were made on damage to crops, harassing of birds and their consequential behaviour.

### Deterrent systems

The problems within the Lakeland Downs farming district of crop damage to peanuts by Red-tailed Black-Cockatoos and the protected status of the bird species, prompted the Department of Environment to investigate effective bird deterrent methods.

According to farmers, a variety of deterrent methods have been tried; including scare guns, shooting, laying of carcasses to attract raptors and vehicle harassment. These methods have had limited success.

- **BirDeter System**

Constant interaction with Lakeland Downs farmers and Department staff of Cooktown office, District Ranger Barry Lyon and Ranger-In-Charge Tony Frisby, over a period of three years, in an effort to resolve the cockatoo problem, resulted in Mr Frisby's research into various devices of bird deterrent methods utilised throughout Australia. Finally this led to a southern Queensland company, Greenspan Technology Pty Ltd and associated company BIRDETER, based at Warwick. BIRDETER is a bird deterrent system which has proved successful in orchards in the south. Mr John Muehlebach, Technical Services Manager, was contacted by Mr Frisby and negotiations led to Mr Muehlebach installing the deterrent system within a peanut crop at Lakeland Downs. At the March meeting the functions of the system were explained briefly by Mr Frisby and it was agreed at the meeting, in concurrence with Mr Inderbitzin, that the deterrent system be installed on one of his peanut paddocks targeted by cockatoos. The associated cost of trialling the deterrent system was borne by the Department of Environment.

The deterrent system is an all-weather sound projection, computer operated and powered by a solar panel charging a 12 volt battery for each radar pole and deterrent speaker system and a transmission/receiving system. The total system comprises two radar poles and the (speaker) sound system. The concept behind the deterrent system is that the radar poles are strategically located within an active site (damaged area). The radar poles are placed approximately 300 metres apart (distance between poles varies according to extent of damage and or area of coverage required, depending on flight path of birds and or habitual activity which provide maximum and appropriate activation of the deterrent system) thus

creating a radar field between the two radar poles at 40 degrees in the shape of a diamond. The speaker system is located in an appropriate position so as to obtain maximum and effective sound projection over as large an area as possible within the targeted crop. Birds fly into and or through the radar field which triggers the sound system by way of transmission/receiver system from radar pole to sound system. At the sound system the computer then selects, at random, a series of programmed sounds which are then projected out of two large loud speakers which are positioned for maximum coverage. The sounds are a composition of the call of a distressed Red-tailed Black-Cockatoo, other bird species' distress calls, gun shots and human voices. Sounds are not repetitive and are selected at random. The sound sequence is intended to project sound at random, eliminating the possibility of birds becoming familiar with the system and or adopting habitual behaviour. An additional program within the sound system is that should there be a time lapse of no bird activity, the deterrent system self-activates after a random delayed period. This is to counteract the possibility of birds flying into the paddock in areas other than between the radar poles.

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Plate 3. Deterrent sound system located in Test Site paddock approximately 400 metres from radar poles at the eastern edge of the paddock providing a total coverage of the paddock.

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Trials with BirDeter commenced on Saturday 5 April. Assembly and installation of the deterrent system was completed by Mr Muehlebach and departmental staff from Cooktown.

Test Site paddock was the site identified to trial the sound deterrent system. At the beginning of the study period the cockatoos were targeting this area quite heavily and therefore the site was an ideal test location. The trial period was for approximately one month. (Refer Results, Sound system page 12).

At a latter phase of the study period, observations at the beginning of May revealed large numbers of both species of cockatoos feeding in Cow Pea paddock. I spoke with Mr



Inderbitzin and he voiced his concern over the possible damage that may be caused by the cockatoos on the emergent crop. It was decided to relocate the deterrent system from test site paddock to cow pea paddock. Appropriate location of deterrent system was not possible due to farming activity within the cow pea paddock. Most of the bird activity was to the centre and south of the paddock, an ideal location to install the radar poles. Unfortunately, because of machinery operations within the paddock radar poles were located to the north of the paddock and the sound system was located adjacent to center of center pivot. Radar poles covered an area of approximately 300 metres across the north face of the paddock, installed in grassed area beyond the sown crop. The sound system was adequate in its location although ideally a more central position may have proved more effective. (Refer Results, Sound system page 13). Both Test Site and Cow Pea paddocks were the only locations BirDeter was trialled.

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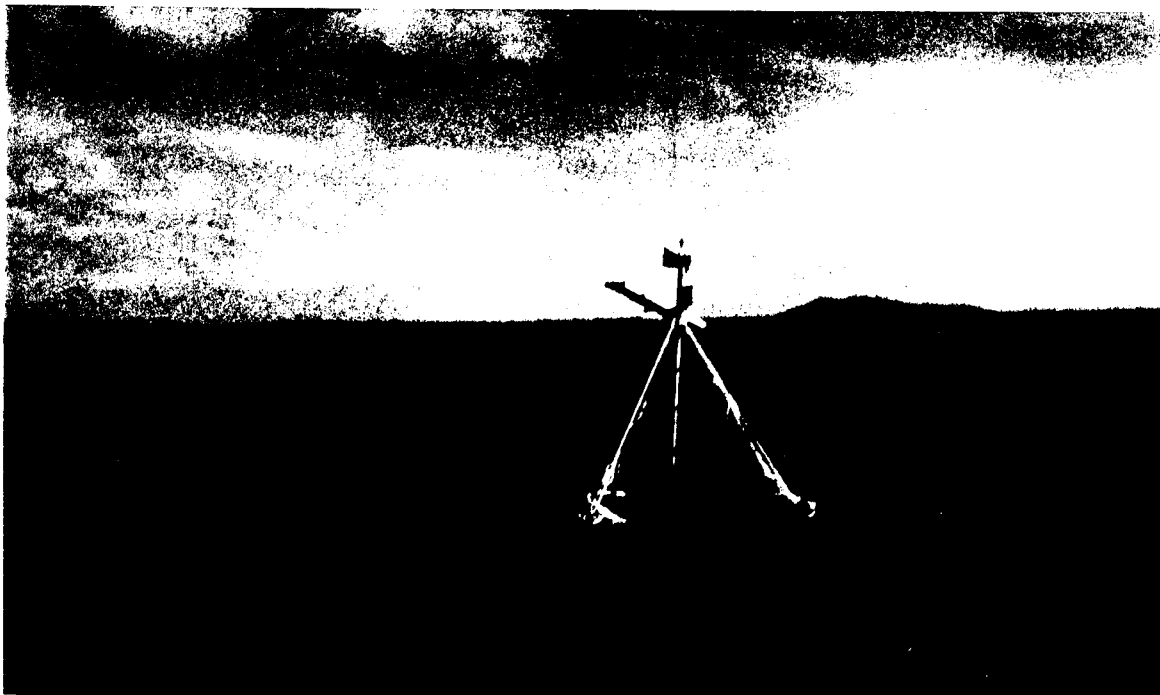


Plate 4. Radar pole (one of two) within damaged area. Both radar poles were placed 200 meters apart to provide maximum coverage of the targeted area.

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- Sacrificial crop

During the course of the study, especially during the first three weeks, cow pea paddock and residual paddock were utilised by Peter Inderbitzin as a sacrificial (decoy) crop. Providing a food source to lure birds into a specific location, undisturbed, thereby training the birds to target a particular crop throughout the growing season away from productive crops proved successful and has merit, although farmers were not convinced of its economy when associated costs were considered.

The sacrificial crop appears to be very effective in concentrating the birds within one area, the strategy being that the birds are not attracted to the other crops whilst peanuts are available. This was clearly evident during the early phase of the study period. While this strategy proved very effective, unfortunately all available peanuts were either consumed or as the *Brachiaira* matured the birds found it too difficult to search for peanuts, and, midway through the study period had abandoned the paddock entirely and dispersed into productive peanut crops. My observations certainly support the theory of providing the birds with a sacrificial crop or feeding area. This theory was discussed at length with the farmers and in general they

agreed that the strategy is effective although the farmers were conscious of the cost effectiveness of such a crop as the farmers argued that a sacrificial crop would require similar maintenance to a productive crop, especially in disease management. The alternative method to the sacrificial crop - providing a feeding place for the birds where the birds were not harassed, were trained to feed, with a continuous supply of peanuts, was agreed in principal. Again, farmers argued that peanuts from last years crop were not preferred by the cockatoos because of the age of the nuts, the birds preferring fresh peanuts. Additionally, the farmers argued the required tonnage and cost effectiveness of such a method. According to the farmers this method had been trialed. My observations indicate that the sacrificial crop certainly does work as a "deterrent" from productive crops. The pros and cons would require further study and the methods should not be ruled out as a potential pest management strategy.

Subsequent to the field work inquiries were made on the costs of growing a sacrificial crop and the possibility that these could be offset by royalties from tourists. Cost of fungicide, herbicide and plane hire were about \$1000 per ha per season according to Mr Barry Hosking but determination of total cost will need further discussions with the farmers. Some costs may be unnecessary if the peanuts are to be grown for cockatoos rather than people.

There is an opportunity, if the farmers are agreeable, to retrieve a substantial part of this cost from tourists. Six tourist operators were contacted, all of whom were interested in the concept of seeing wildlife at Lakeland for which they would be prepared to pay \$2 per head. However all said that their brochures were printed for 1998 and that they would not be able to offer the service until 1999. Given that wildlife, including both the Red-Tailed Black Cockatoos and Bustards, are present at Lakeland throughout the year, it will be possible to collect royalties for the duration of the tourist season and not just when the peanuts are growing.

#### 4. RESULTS

- Summary of Appendix 1 & 2.

Observations commenced on 19 March 1997.

At the beginning of the study period approximately 2000 birds were counted. Local movements were identified as were feeding sites and roosting sites. The initial observations were carried out within the 7B paddocks aggregation. (Refer Appendix 1 for field notes).

General observations revealed a change in bird roosting habits and favoured feeding sites from initial observations on 19 & 20 March. Cockatoos have abandoned the roosting site adjacent SW corner paddock and now prefer the 8 Mile. Harassment by farm staff and my continued presence has contributed to the wider distribution of birds to various feeding sites. Observations also revealed that the cockatoos are feeding on Inderbitzin's farms only - no where else has there been reported damage. Considering the cockatoos fly over peanut crops of other farms (eg; test site paddock to home paddock, a distance of approximately 12 kilometers where the Hosking and Anderson farms are located within the flight path). The birds have shown no interest. A simple explanation might be that the location of the Inderbitzin's farms are adjacent to ideal roosting sites, close proximity to water and generally a safe refuge, whereas the other farms located in relatively open areas.

South west corner paddock, triangular paddock and home paddocks were the areas consistently targeted by the cockatoos. This pattern of behaviour prevailed throughout the study period until harvest.

The cockatoos were continuously harassed during the study period by farm staff by way of gun shots, vehicle harassment, machinery activity within the paddocks and in test site paddock by the sound system. The continuous harassment methods proved effective in so much as minimising crop damage to the 2% estimate of the total crops sown by Inderbitzin.

The Hosking family reported no damage to their crops, although some bird activity was reported during the harvest when peanuts were unearthed for drying, and this can be attributed to harassment methods as applied by the Inderbitzin's. Although the cockatoos did not specifically target the Hosking paddocks, a number of cockatoos were shot. A combination of harassment techniques and the proximity of the paddocks within the district favoured the Hosking's from sustaining damage to crops.

- Damaged Center Pivot Irrigator

On the 21 April I was approached by farm staff, and a request via Mr Inderbitzin, to inspect cockatoo damage on electrical cable along pivot irrigator, located within residual and cow pea paddocks. According to staff, damage was by red-tailed black cockatoos several days prior. Inspection revealed substantial damage along the entire length of the cable. Power is supplied to electric motors to each wheel assembly which drive the pivot irrigator, the irrigator is 500 metres in length. Farm staff advised that they had been working on the irrigator for two days and it will take at least a week to repair. The cable is approximately 20 mm in diameter,

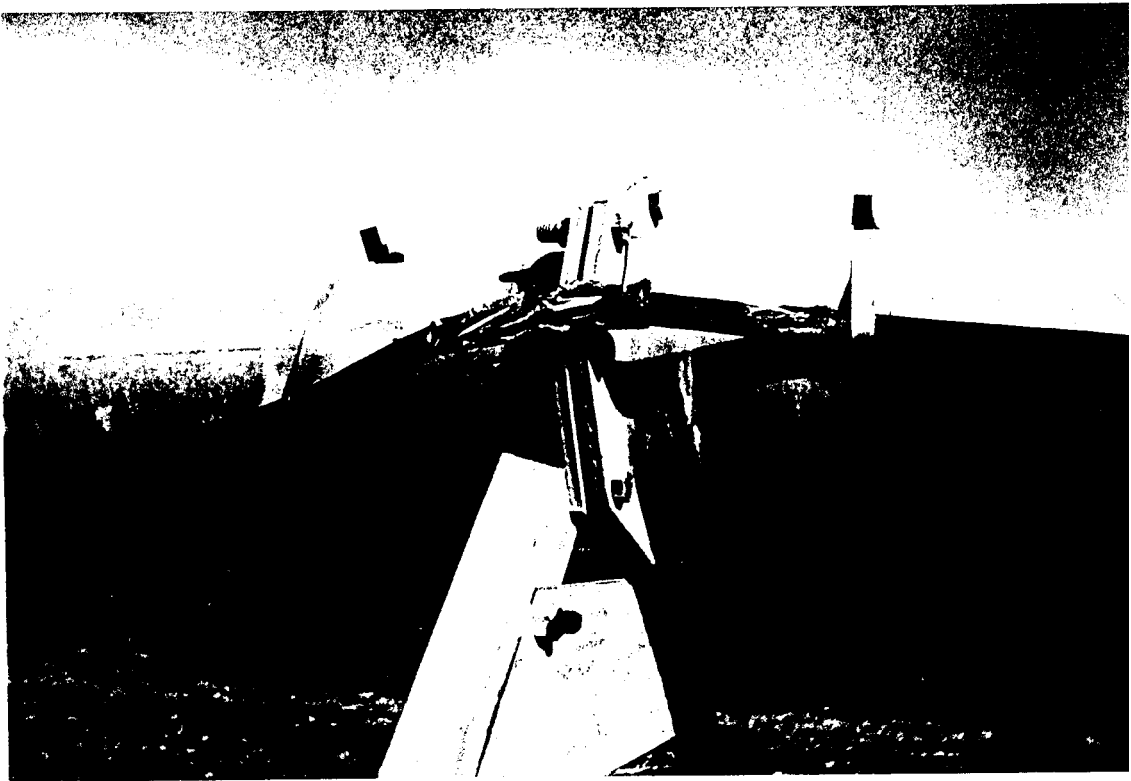
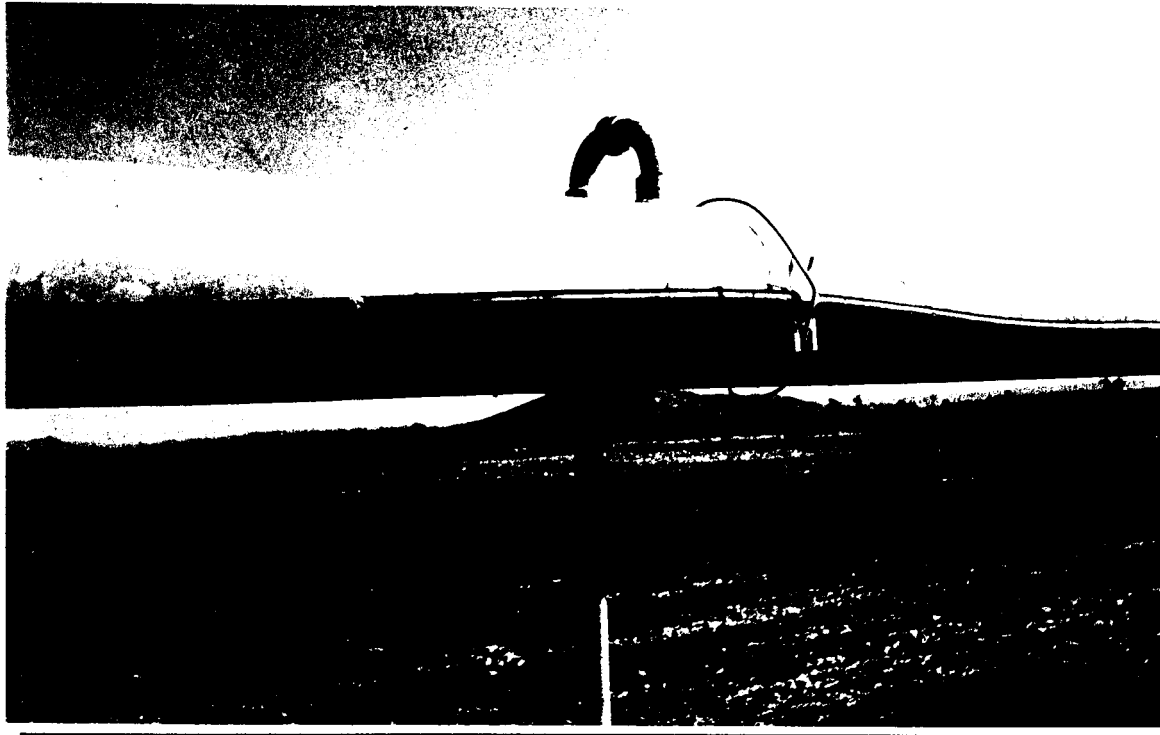


Plate 5. Above. Electrical cable damage on pivot irrigator by Red-tailed Black-Cockatoos, 7 cow pea paddock.

Plate 6. Below. Cable damage by cockatoos in foreground. Background is of cow pea paddock, 7B, recently ploughed and sown which is attracting both species of cockatoos to the paddock.



casing structure is an outer layer of black poly plastic and an inner layer of aluminium film followed by another layer of black plastic and an internal assortment of plastic coated, colour coded wiring. Such are the chewing capabilities of the cockatoo that the cable was penetrated and internal wiring was severed (plate 5).

According to Mr. Inderbitzin, \$5000 damage was sustained.

- Sound system

Observations at test site paddock over 9 days indicated that the deterrent system was very effective. The system functioned without being monitored for an additional 6 days and no additional damage was evident, which would indicate that the birds have been trained not to venture into the test site paddock. Such is the change of behaviour of the birds that the findings would indicate that once the birds have been trained to avoid an area it is quite possible to relocate the deterrent system to another location. For the period 1.5.97 to 30.5.97 (day of harvest) the test site paddock did not receive further damage in the absence of the deterrent system. This supports the theory that birds are trained to avoid an area once initial deterring has been effective and birds are seen to avoid the area. Further trials would be required to substantiate these findings, but the results thus far are positive.

Observations at the beginning of May revealed large numbers (approximately 3000 in total) of both species of cockatoos feeding in cow pea paddock. With the sowing on new crops (cow pea) and the damage to the center pivot irrigator, discussion with Inderbitzin favoured the relocation of the sound system from test site paddock to cow pea paddock. Installation complete, the sound system was activated and this had an immediate effect on both species of cockatoos. Birds did not leave the area but circled and alighted on the field and continued o

feed. The system self-activated (triggered), and again the birds took flight and on this occasion the birds headed for adjacent woodland. Noticeably sulphur-crested cockatoos left the area entirely whereas a number of red-tailed black cockatoos remained roosted within the tree line adjacent the paddock.

After the initial installation I monitored the sound system for two consecutive days and the sound system was effective in so much as deterring the birds from approximately 3000+ cockatoos, of both species, to a reduced number of 30. As mentioned above, the location of the deterrent system was not positioned in the desired location and the maximum effectiveness of the sound system was not realised; nevertheless, the system proved again its deterrent capabilities.

- Sound system trials complete

On 29 May at approximately 7.30 am in the company with Mr John Muehlebach and Mr Inderbitzin, the effectiveness of the bird deterrent system was heavily debated. Mr Inderbitzin was not convinced of the effectiveness of the deterrent system although he did indicate disappointment when advised the deterrent system was to be dismantled and removed today, the trials having now been completed. Mr Inderbitzin admitted that he sustained little if any damage to the emergent cow pea crop as he initially feared. Mr Inderbitzin was advised that the deterrent system was a contributing factor and is credited with the little damage caused to the crop. Mr Inderbitzin was advised by Mr Muehlebach and myself that the deterrent system was effective in deterring the birds out of test site paddock and that when the system was installed he sustained no further damage. Mr Inderbitzin reluctantly agreed that such was the case but continued to disagree on the effectiveness of the system. Mr Inderbitzin was of the opinion that the Department should shoulder the responsibility of the cockatoo problem and that the Department purchase and make the deterrent system available to farmers. Mr Inderbitzin was advised by myself that the Department would not entertain such an action. Also, during the course of the conversation, Mr Inderbitzin advised that he has sustained approximately \$30,000 in damage to his peanut crops. Mr Muehlebach advised Mr Inderbitzin that if he sustained \$30,000 of crop damage to peanuts, then the purchase of at least 4 deterrent systems would pay for themselves in one season, and that 4 deterrent systems strategically placed throughout the peanut crops would cover a large proportion of his total peanut crops. In response, again Mr Inderbitzin reiterated that the Department should shoulder the problem. The conversation continued and Mr Inderbitzin advised that he has planted sunflower in conjunction with cow pea in the recently ploughed paddock and was concerned over the damage that might be caused by the cockatoos, and that in total he has 40 acres under cow pea and 20 acres under sunflower. Mr Inderbitzin was advised that an area of this size would be well covered by the deterrent system given the proven effectiveness over 100 acres in test site paddock. Again Mr Inderbitzin avoided the reality that the deterrent system is effective, and on this occasion he intended to have farm staff living adjacent to the paddocks and conducting deterring activities. Mr Inderbitzin was advised that the deterrent system would spare staff from carrying out such activities availing themselves to more productive and cost effective farm duties. Mr Inderbitzin advised it was a situation he had to bare.



Plate 7. In the far background of photograph, 2000+ sulphur-crested cockatoos and 1000+ red-tailed black cockatoos active in recently ploughed cow pea paddock - The site of the relocated sound system. In the foreground are mature peanut plants. Such was the easy picking of the exposed old peanuts within recently ploughed cow pea paddock that the cockatoos showed no interest in digging for fresh peanuts from the adjacent standing mature crop. These observations again support the theory of providing a sacrificial crop or feeding site to attract cockatoos away from productive crops.

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## 5. CROP DAMAGE ASSESSMENT

7B farm is an area incorporating mixed crops; the majority of crops sowed were peanuts (refer locality map 2). This particular farm is surrounded by open woodland providing a safe refuge, excellent roosting localities and access to water for the cockatoos, hence crops sowed within the 7B locality have been heavily targeted by the cockatoos. A similar situation exists within the home paddocks and test site paddock. Jeffrey Anderson's paddocks are similarly situated, although direct and safe access to water is lacking. The remaining peanut crops within the district have been sowed in open paddocks within mixed crops and not contiguous with open woodland, hence no damage was sustained.

According to farmers, in the past, Graham Green was the first farmer to sustain crop damage. This can be attributed to Mr Green's paddocks being located nearest the 8 Mile roosting sites and in direct contact with the birds' flight path to 7B and beyond. In previous years Mr Green was heavily targeted by the cockatoos and such was the extent of the damage that Mr Green chose to change crops from peanuts to maize this year. According to farmers the cockatoos have adopted habitual activities from season to season targeting the same areas each year with Mr Inderbitzin's paddocks receiving the majority of damage. For this reason, damage assessment was focused on Mr Inderbitzin's crops, other farmers sustaining nil damage.

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Mr Inderbitzin sowed approximately 700 acres of peanuts in total. Areas of crop damage in acres have been ground-truthed and therefore are a conservative estimate. (Table 1.)

Table 1. Location and extent of damage, Inderbitzin property.

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Triangular Paddock	3 acres
South West Corner Paddock	4 acres
South East Corner Paddock	0.5 acres
Home Paddock	4 acres
Test Site Paddock	1.5 acres
Total: 13 acres	

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**Approximately 2% of total crop was damaged.**

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Crop damage in monetary terms was calculated on volunteered information only. For ethical reasons, Peanut Marketing of Australia, Tolga, supplied information relating to the district and not individual farmer's quotas and returns. Peanut Marketing of Australia advised a before harvest forecast of approximately 3000 tonnes of peanuts @ \$800-\$1000 per tonne from the Lakeland Downs district.

Information from farmers indicates that to grow peanuts costs approximately \$400 per acre. An expected yield of 1-2 tonnes per acre is also forecasted.

Loss of revenue from damaged crops, calculated on mean acreage, tonnage, costs and price is shown in Tables 2 & 3.

TABLE 2. Loss of revenue from damaged crops (calculated on acres).

INDERBITZIN		ACREAGE		
Location	Acres	Mean price per acre: \$1350	Average growing price per acre: \$400	Average nett price per acre: \$950
All	700	945,000	280,000	665,000
	Damaged acres			
Tri Pdk	3	4,050	1,200	2,850
SW Pdk	4	5,400	1,600	3,800
SE Pdk	0.5	675	200	475
Home Pdk	4	5,400	1,600	3,800
Test Pdk	1.5	2,025	600	1,425
TOTALS:	13	17,550	5,200	12,350

Shaded column indicates total loss of revenue from damaged crops.

TABLE 3. Loss of revenue from damaged crops (calculated on tonnage).

INDERBITZIN		TONNAGE			
Location	Acres	Mean tonnage per acre: 1.5	Mean price per tonne: \$900	Average growing price per tonne: \$266	Average nett price per tonne: \$633
All	700	1050	945,000	279,300	664,650
	Damaged acres				
Tri Pdk	3	4.5	4,050	1,197	1,899
SW Pdk	4	6	5,400	1,596	2,532
SE Pdk	0.5	0.75	675	199.5	316.5
Home Pdk	4	6	5,400	1,596	2,532
Test Pdk	1.5	2.25	2,025	598.5	949.5
TOTALS:	13	19.5	17,550	5,160	8,229

Shaded column indicates total loss of revenue from damaged crops.

## 6. SACRIFICE CROP AND TOURISM

Subsequent to the field work, inquiries were made on the possibility of paying for the costs of growing a sacrificial crop by charging tourists to see the cockatoos and other Lakeland wildlife. A number of tourist operators operators (AAT King Tours, Australian Pacific Tours, Far Out Extended Eco-Tours, 4x4 Tag-along Tours, 4x4 Adventure Tours, Kirrama Wildlife Tours, Polley's Coaches, Cape York Guides to Adventure and Capricorn Coast Tours, Wilderness Challenge, Oz Tour Safaris) were asked whether they would be interested in taking tourists to see the black-cockatoos at a cost of \$2.00 per head. All expressed enthusiasm for the concept as Lakeland is currently in the middle of a lengthy stretch of travelling with few attractions. While most had already printed their brochures for 1998 they said they would be very keen to participate during 1999 and asked to be kept informed on developments. It is envisaged that operators would pay money into an account from which funds would be made available to offset the costs of cultivation of the sacrifice crop. Administrative details, however, would have to be worked out in consultation with the farmers and tourist operators involved. Ideally a local Lakeland resident would be involved as a guide so that self-propelled tourists could also have the opportunity to see the birds and pay for the crop.

Questions that arise from the concept of paying for crop damage mitigation with ecotourism, and suggested answers, are as follows:

i. What is the minimum area required to attract and sustain the cockatoos through the peanut growing season?

The two paddocks which effectively acted as sacrifice crops in 1997 had a total area of about 200 acres but only 13 acres of commercial crops were damaged, possibly because the sacrifice crop was available and the crop was partially protected by the BirDeter sound system. The area needed by the current cockatoo population could therefore be double that measured as damaged at about 25 acres.

ii. How much would the sacrifice crop cost?

In 1997 the sacrifice crop cost next to nothing, but nor was it effective for the whole season because either the *Brachiaria* grew too high or the peanuts ran out. On the other hand it is probably unnecessary to put as much herbicide and insecticide on peanuts grown for cockatoos as it is on nuts grown for people so that the costs should be less than \$400 per acre estimated for commercial crops. If old peanut paddocks can be set aside for sacrifice crops and only enough herbicide/pesticide applied to prevent disease in other commercial



crops on the property then the total cost of a 50 acre sacrifice crop could be  $25 \times \$200 = \$5,000$ , possibly less. At \$2.00/head this would require visits from 2,500 tourists per year.

iii. Most peanut cropping is complete by the time the main tourist season begins so what would the tourists see when they went to the sacrifice crop?

By the time they reach Lakeland many tourists are desperate to see anything. They do not need to see the crop itself or the big flocks of cockatoos feeding on it. Rather they would be shown the cockatoos wherever they are in the farming area and be told something about them. They would be shown the sacrifice area and it would be explained how their contribution was helping save the cockatoos' lives and they would also be shown some of the other wildlife in the area. Two features other than the cockatoos of interest would be the freshwater crocodiles in Honey Dam and the Bustards or Plains Turkeys which are exceptionally common at Lakeland and have disappeared from much of the southern part of the continent. Many tourists would also be interested in the farming itself.

iv. Won't feeding the cockatoos lead to an increase in the population?

It may lead to a slow increase but for other species of black-cockatoo the main factor controlling population size is the success of breeding birds. Since Red-tailed Black-Cockatoos raise at most only one young per year and, in the tropics, probably suffer heavy predation at the nest from goannas, the factors most likely to determine population size are those that operate at the nesting site. There is no suggestion that the cockatoos feeding on peanuts are breeding, the flocks being typical of flocks that get together after breeding has finished. Survival at this time is typically high and it is unlikely that the availability of peanuts has contributed to any increase in black-cockatoo numbers that might have occurred unless they have helped improve the survival of newly fledged chicks. Rather the black-cockatoos at Lakeland have probably been drawn from a wide area, a source area that may or may not be increasing in size. This is in contrast to the numbers of Sulphur-crested Cockatoos which probably have increased as a result of greater food availability. Sulphur-crests raise up to four young in a nest and the more food that is available the more young they can raise.

Other issues will no doubt arise during discussion with farmers whose enthusiasm for the idea will be essential if the plan is to be successful.

## 7. SUMMARY

Pest management is an integral part of farming and a 2% crop damage to peanuts by cockatoos can be appraised as small compared to the overall quotas produced within the farming community. Nevertheless, one cannot dismiss the fact that all of the damage was borne by one farmer and it is understandable that this particular farmer has been quite vocal about the problem associated with cockatoos. This farmer sustained approximately \$17,550 worth of damage to peanut crops by Red-tailed Black-Cockatoos in 1997. One can argue that there will always be loss of yield through various pest invasions, pathogens etc and question what level is acceptable to the farmer. Although 2% damage caused by cockatoos appears little, if added to the total loss of yield by other pests, disease and management techniques the total percentage lost would be much higher. Certainly cockatoo damage has now been substantiated and it is the Department's responsibility to determine what course of action, if any, is now required within the Lakeland Downs farming community.

The Parliament of Victoria Environment and Natural Resources Committee, Problems in Victoria Caused By Long-Billed Corellas, Sulphur-Crested Cockatoos And Galahs, (November 1995) has been advised that one of the findings of a 1985 inquiry conducted by the Land Protection Regional Advisory Committee was that they were not just dealing with an actual problem of bird damage, but were also dealing with the very strong perception in the farming community of the problem. That is perhaps a more significant problem than the actual damage caused by the birds. (Voigt (Department of Conservation and Natural Resources, Victoria) Environment and Natural Resource Committee Briefing. 12 December 1994).

The Committee reiterated that the perception of bird damage problems is an important aspect of the farm and bird management equation. It should neither be ignored nor dismissed.

This study within the Lakeland Downs farming community parallels the findings of the Environment and Natural Resource Committee regarding parrot damage to crops with respect to Red-tailed Black-Cockatoos and peanut damage. The Far Northern Region is also not just dealing with an actual problem of bird damage, but with a very strong perception of the problem in the farming community.

In response the Department is recommending the adoption of two techniques that it is hoped will both reduce the level of damage sustained by the Red-tailed Black-Cockatoos and pay for some of the costs. Progress towards resolution of this issue will require further discussion with the farmers.

## RECOMMENDATIONS

1. Farmers be encouraged to reconsider the sacrificial (decoy) crop as an alternative deterrent method in an integrated pest management strategy. If farmers agree a feasibility study would be conducted to determine whether the costs of such a crop could be offset by income from tourists coming to see the cockatoos and other Lakeland wildlife.
2. Farmers also be advised that an effective deterrent system (BirDeter) is now available and are to be encouraged to pursue this innovative system and incorporate the system in an overall integrated pest management strategy.
3. A study of the movements and feeding ecology of the Red-tailed Black-Cockatoo be undertaken to inform arguments for the species management in future.
4. A workshop be conducted with farmers and departmental staff early in the 1998 growing season with an agenda based on the findings of this report.

While it is not recommended that Damage Mitigation Permits be phased out, it is hoped that it will no longer be necessary for farmers to seek such permits if the methods advocated in points 1 and 2 are put into operation. The fact that only 25 cockatoos were shot during the growing and harvesting periods suggests that farmers were either too busy or were reluctant to shoot cockatoos. Also the losses sustained, though fairly small, occurred despite the permits being issued, suggesting shooting is ineffective.

## ACKNOWLEDGEMENTS

I wish to thank the farmers of Lakeland for their co-operation with this report: Barry and Darren Hosking, Jeff Anderson and Steve Ahlers. A special thankyou to Peter and Franziska Inderbitzin and their staff for their willingness to co-operate throughout the study period.

A very special thankyou to Department of Environment staff of the Cooktown office for their contributions at the initial stage of the study period. Their history of information and support was greatly appreciated.

I also wish to thank Mr John Muehlebach of Greenspan Technology Pty Ltd for his enthusiasim in farmer liasion and of information support with regards to the sound system (BirDeter) trials and its technology.

Finally I wish to thank Amanda Freeman and Steve Garnett for their editing and contributions in the finalisation of this report.

## APPENDIX 1.

### OBSERVATIONS:

Following are extraction's from field notes.

- . . . . . 19.3.97 approximately 50 cockatoos sighted feeding in home paddock. 1000+ cockatoos feeding in residual paddock. 100+ cockatoos active in test site paddock and 40+ birds feeding in south west corner paddock.
- . . . . . obs on morning of 20.3.97 at 6am, 7B paddocks. Approximately 2000 birds roosting in open woodland adjacent SW corner paddock. Birds were able to be counted with a high degree of accuracy as birds maintained a roost for approximately 30 minutes. At approximately 6.30 am birds began to leave roosting site and most flew into residual paddock and began feeding. Small flocks headed towards the east to test site paddock and beyond to home paddock. The roosting site presently occupied (refer locality map 2) is in the valley of the Laura River. This locality provides ease of access to water, excellent roosting sites and refuge, and an abundance of peanuts nearby. . . . . obs from 3.30 pm till 6.00 pm, 7B paddocks. Observations were made from point of entry access road. Majority of birds were feeding in residual paddock. Within this time period birds began leaving residual paddock and headed for roosting sites adjacent SW corner paddock. By 6 pm all birds had left residual paddock and again a count of birds estimated at 2000, a precipitation of light showers from the east commenced.
- . . . . . 21.3.97. At 6.30 am sighted birds feeding in SW corner paddock - small flocks coming from the west up the Laura valley probably from the 8 Mile area - refer locality map 5. A flock of 40 birds headed towards the test site paddock. Birds were harassed from this site and for most of the day majority of birds were active in residual paddock and triangular paddock. Approximately 1500 birds counted.
- . . . . . no obs for next 10 days. 1.4.97 obs from access entry point to 7B paddocks. Initially no cockatoos sighted. Not till 8 am within test site paddock were birds sighted feeding. Observations continued for approximately 30 minutes of which small flocks of 5s, 10s, 20s in number flew up from the Laura valley and alighted onto test site paddock. . . . . 6.20 pm observed cockatoos returning to roost at the 8 Mile - number of birds unknown due to scattering of birds at roost site.
- . . . . . 2.4.97 obs at 5.30 am at the 8 Mile indicated a scattering of cockatoos. Movement of birds was erratic. Small flocks were departing roosting sites in easterly direction towards 7B paddocks and in a north-easterly direction towards home paddocks. Obs continued at 7B, 7 am, approx 60+ cockatoos roosting along tree line adjacent sw corner paddock. Observations for approx 45 minutes, small flocks of cockatoos arriving within the area and roosting. No birds feeding. As per yesterday, a similar pattern of activity was apparent. . . . . 9.45 am, approximately 200+ birds feeding in test site paddock - whilst observing small flocks of 5s & 10s continued to join primary flock.
- . . . . . 7.4.97 refer to BirDeter System page 8.
- . . . . . 8.4.97, 7B paddocks. 7.30 am observed 50+ cockatoos feeding in SW corner paddock. *Additionally, 150+ sulphur-crested cockatoos feeding together with red-tailed black cockatoos.* Red-tailed black cockatoos were observed coming into the paddock from the Laura valley flying low below the tree line, not roosting, but alighting directly onto the paddock. Numbers of cockatoos increased slowly as did sulphur-crested cockatoos till birds were harassed.
- . . . . . 9.4.97, 1.50 pm. 400+ birds feeding on SW corner paddock - this particular site and the congregation of peanut paddocks within 7B are significantly favoured sites in so much as they are the initial point of contact with birds and peanut crops at the western extremity

of peanuts sown in the district nearest the 8 Mile roosting sites. . . . . 2.30 pm, triangular paddock, 150+ birds feeding in cow pea paddock adjacent large damaged area. Birds harassed and birds dispersed to the Laura valley. . . . . general observations, cockatoos appear to be working in two groups of 200+ each group in 7B paddocks. Birds disturbed and fly to roosting area, Laura valley, along tree-line adjacent peanut paddocks. Vehicle is removed from paddock and out of sight of birds - birds begin to feed at various sites within 7B. Harassment pattern is continued throughout the afternoon and the birds are distributed into smaller flocks and now alternate feeding sites utilising the tree-line during harassment intervals. At no point during the harassment period did birds make an effort to leave the area entirely. Such was their desire to feed on the peanuts that at one stage of the harassment period, the vehicle, was parked within a damaged area and after a short period birds began to alight onto the crop a few metres from the vehicle and begin feeding.

- . . . . . 10.4.97, obs at 7B, SW corner paddock, 8 am. 300+ sulphur-crested cockatoos and 100+ red-tailed black cockatoos feeding. Damage to this site is now attributed to both species. . . . . home paddock east of access road, 9.45 am, 200+ cockatoos feeding, some roosting. . . . . 7B obs, 4 pm, east coast showers penetrating inland, 5 only cockatoos flew over, eventually no birds sighted as rain began to fall, appears birds have left the area entirely.
- . . . . . 11.4.97 obs commenced 6 am, 7B paddocks. 150+ sulphur-crested cockatoos roosting adjacent SW corner paddock. Not till approx 7 am did red-tailed black cockatoos begin to arrive in flocks of 5s & 10s in number from the Laura valley. Observed for approx one hour during which birds continued to arrive in this pattern and numbers swelled to 100+. . . . . test site paddock, 20+ birds sighted.
- . . . . . 21.4.97 obs, 7B, SE corner paddock, 30+ birds feeding within this site.
- . . . . . 22.4.97 obs 7.30 am, 60+ cockatoos feeding in SW corner paddock. Upon arrival birds broke up into small flocks, a flock of 20+ birds headed towards test site paddock and the remainder headed to and alighted upon cow pea paddock. Cow pea paddock was recently ploughed and exposed peanuts of the sacrificial crop are now attracting birds back into this particular area.
- . . . . . 22.4.97 obs continue, 11.15 am, home paddock adjacent Inderbitzin's residence, 250+ birds feeding in this area, two large areas of damage peanuts within this paddock. Birds have been active in this area for the entire study period. . . . . obs 6.30 pm, 8 Mile, birds continue to utilise this area as a favoured roosting site.
- . . . . . obs 23.4.97, cow pea paddock. 6.30 am, 2000+ sulphur-crested cockatoos feeding in recently ploughed cow pea paddock. Upon my arrival sulphur-crested cockatoos dispersed towards Laura valley upstream towards corn paddocks. 300+ red-tailed black cockatoos active in cow pea paddock. Observations for approximately 3 hours of birds behaviour - birds continued to arrive and depart the area in assorted flock sizes. Flocks flew towards the east - possibility to Inderbitzin's home paddock. Flocks also came in from the east, a continuous traffic either direction. Majority of birds continued to come into the area from the west - up from the Laura valley and alight onto cow pea paddock. Cow pea paddock is beginning to attract more birds since paddock was ploughed.
- . . . . . 30.4.97, 12.30 pm, 20+ birds feeding in SW corner paddock. Damage to this site continues to increase significantly which is also favoured by the sulphur-crested cockatoos. It appears that the sulphur-crested cockatoos have adopted peanuts as an alternative food source to maize. An explanation for the change of behaviour by the sulphur-crested cockatoos is that the maize kernels have hardened and that the sulphur-crested cockatoos have now included peanuts as a preferred food source. Farmers have observed this change in behaviour and say that this is not isolated to the Lakeland Downs district. Information from peanut and maize farmers on the Atherton Tableland also support the change in sulphur-crested cockatoo feeding behaviour. According to the Atherton

Tableland farmers, the problem of sulphur-crested cockatoo damage to maize crops occurs over a short period whilst the corn kernels are "soft with milky sap", and it is not until the kernels have hardened that the sulphur-crested cockatoos discontinue feeding on the maize crop. . . . . 4.00 pm, obs, cow pea paddock, 300+ red-tailed black cockatoos, 400+ sulphur crested cockatoos active in this paddock.

- 1.5.97 obs, cow pea paddock, 2000+ sulphur-crested cockatoos and 1000+ red-tailed black cockatoos actively feeding together in this paddock. Refer Deterrent System 1.5.97 notes, page 13.

## APPENDIX 2.

### SOUND SYSTEM:

Following are extraction's from field notes and comments made during the study period:

- Monday 7.4.97 . . . . . bird deterrent system is working effectively. No birds observed in test site paddock. John Muehlebach advises system worked very effectively. My arrival back today confirmed, no birds sighted in test site paddock.
- Wednesday 9.4.97 . . . . . inspected test site paddock, no additional damage since bird deterrent system installed. So far a good result. . . . . approx 4.00 pm, test site paddock. Observed cockatoos feeding in far SW corner of test site paddock. Tried to activate deterrent system - did not function. Discovered loose terminal connection to battery. Repaired connection and activated deterrent system with remote control. Approx 100 birds took flight, circled and alighted on the crop and began feeding again. Approx 10 minutes later I activated the machine again, approx 50 birds left towards 7B paddocks. Approx 50 birds remained roosted in adjacent trees to paddock. Approx 15 minutes later system self-activated (triggered) and all but three birds left which perched in tree line. Again approx 15 minutes later system self-activated (triggered) and remaining birds departed towards 7B paddocks. I continued to make observations and again system self-activated (or triggered by crows) and a small flock of previously unsighted cockatoos were frightened off - birds appeared to have left the tree line. The area the birds were observed feeding was approx 800-1000 metres from the deterrent system. Sound from the system (wind assisted, approx 10 knots fresh se winds) appears to be effective at this distance.
- Thursday 10.4.97 . . . . . observations commenced 6.00 am test site paddock, no cockatoos sighted from viewing position throughout vista. Bird deterrent system self-activated 6.30 am - no birds. Approx 7.00 am two birds circled then flew back to the west - possibly scouts - no bird activity thereafter.
- Friday 11.4.97 . . . . . observations commenced 6.10 am, 7B paddock - located approx 5 klm from test site. Not till 7.00 am did cockatoos begin to arrive. Birds came in, in small flocks of 5s and 10s in number from the Laura valley. Observed for approx 1 hour over which birds continued to come in, in this pattern. Bird numbers had swelled to approx 100+. I commenced harassing birds to hopefully push birds towards test site paddock. The harassment worked, upon arrival at test site paddock 20 birds observed feeding between radar poles. Observed activity for a few minutes - the deterrent system did not activate. I activated the system by remote control - this action had an immediate effect on the birds, the birds circled and then alighted and again began feeding between the radar poles. I continued to monitor and it was not until approx 10 minutes later the system was triggered and self-activated, again having an immediate effect on the birds, the birds left the area altogether. Again the system proved to be very effective in deterring the birds.
- *No observations next 9 days.*
- Monday 21.4.97 . . . . . observations approx 11.30 am, test site paddock. Whilst monitoring, bird deterrent system was triggered and activated by crows which are active in this paddock. No cockatoos sighted. No additional damage since last observed on 11.4.97. Deterrent system appears to be very effective.
- Wednesday 23.4.97 . . . . . test site paddock. Cockatoos appear to be avoiding this area entirely. No birds sighted. No further damage evident.
- *No observations for next 6 days.*
- 30.4.97, 12.00 pm, deterrent system working effectively. System was activated by crows, no cockatoos sighted, no additional damage since last observed on 23.4.97.

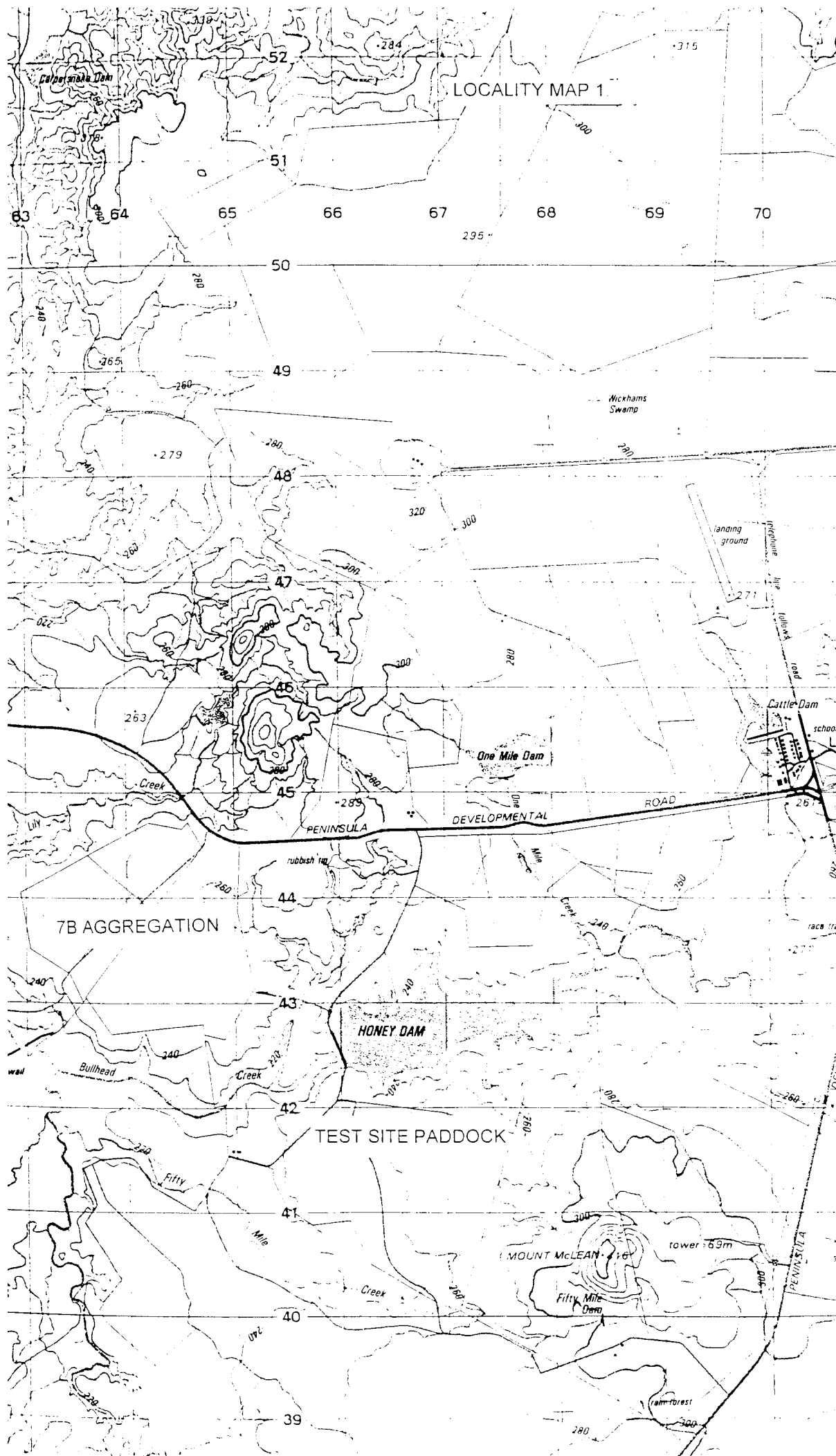
- 1.5.97 . . . . . Observations 7B paddocks, 7.30 am, 2000+ sulphur-crested cockatoos and 1000+ red-tailed black cockatoos feeding in ploughed paddock (cow pea paddock) recently sowed with a new strain of cow pea.
- 2.5.97 . . . . . observations cow pea paddock, 400+ red-tailed black cockatoo feeding within cow pea paddock. Because of lack of activity within the location of the radar poles deterrent system was activated by remote control. The effect was immediate, birds taking flight, a number of birds circled and alighted onto the crop, a number headed for adjacent tree line and roosted and the remainder left the area entirely. For a period of approximately 2 hours the deterrent system was triggered by birds and on occasion activated by remote control. On each occasion birds were frightened off and a reduction in number to approximately 30 cockatoos remained. The remaining birds were located within a depression at the western extremity of the sowed paddock adjacent triangular paddock a distance well over 1 kilometer which is probably beyond the effective range of the sound system.
- 14.5.97 . . . . . observations 7B, cow pea paddock, small flock of 20+ sulphur-crested cockatoos feeding within southern section of paddock. No red-tailed black cockatoos sighted. Deterrent system appears to be deterring majority of birds away from this paddock. Cow pea germination/emergents not affected by cockatoos. Observations throughout the day revealed a pattern of activity of small flocks of birds entering the cow pea paddock and being deterred by the sound system at intermittent stages. Birds appeared to have found this deterrent pattern disruptive and had little time to settle and little if any consumption of residual peanuts or damage occurred.
- *All peanut farmers are now harvesting and cockatoos are distributed throughout the farming district. Favoured feeding sites appear to be Jeff Anderson's paddock adjacent the school (harvest complete), and according to farm staff, home paddocks (harvest complete) have been heavily targeted.*
- 28.5.97 . . . . . observations 5.30 pm, 7B, cow pea paddock - no birds sighted within paddock.
- 29.5.97 . . . . . observations approx 7.00 am, 7B, cow pea paddock. 400+ sulphur-crested cockatoos departed upon arrival. Sulphur-crested cockatoos were feeding in southern section of cow pea paddock - away from the radar poles. No red-tailed black cockatoos sighted within paddock. . . . . *test site paddock, most of paddock harvested, some sections of peanuts pulled and exposed on surface awaiting harvest - no cockatoos sighted within entire area. Cockatoos appear to be avoiding the area after initial deterrent system was trialled. If there is a premium period to attract cockatoos, it is during the harvest when peanuts are most vulnerable to cockatoos and crops would sustain maximum damage. The deterrent system was effective not only during the trial period, but thereafter, having trained the cockatoos to avoid the paddock altogether.*



## REFERENCES

The Committee (Parliament of Victoria) Environment and Natural Resources Committee, Problems In Victoria Caused By Long-Billed Corellas, Sulphur-Crested Cockatoos And Galahs, November 1995.

Voigt, (Department of Conservation and Natural Resources, Victoria) Environment and Natural Resource committee Briefing, 12 December 1994.



LOCALITY MAP 1

7B AGGREGATION

TEST SITE PADDOCK

HONEY DAM

MOUNT McLEAN  
tower 69m

Fifty Mile Dam

One Mile Dam

Cattle Dam

school

Wickhams  
Swamp

landing ground

rubbish tip

race track

DEVELOPMENTAL ROAD

PENINSULA

PENINSULA

rain-forest

Bullhead Creek

Fifty Mile Creek

Mile Creek

rain-forest

Creek

Creek

Mile Creek

road

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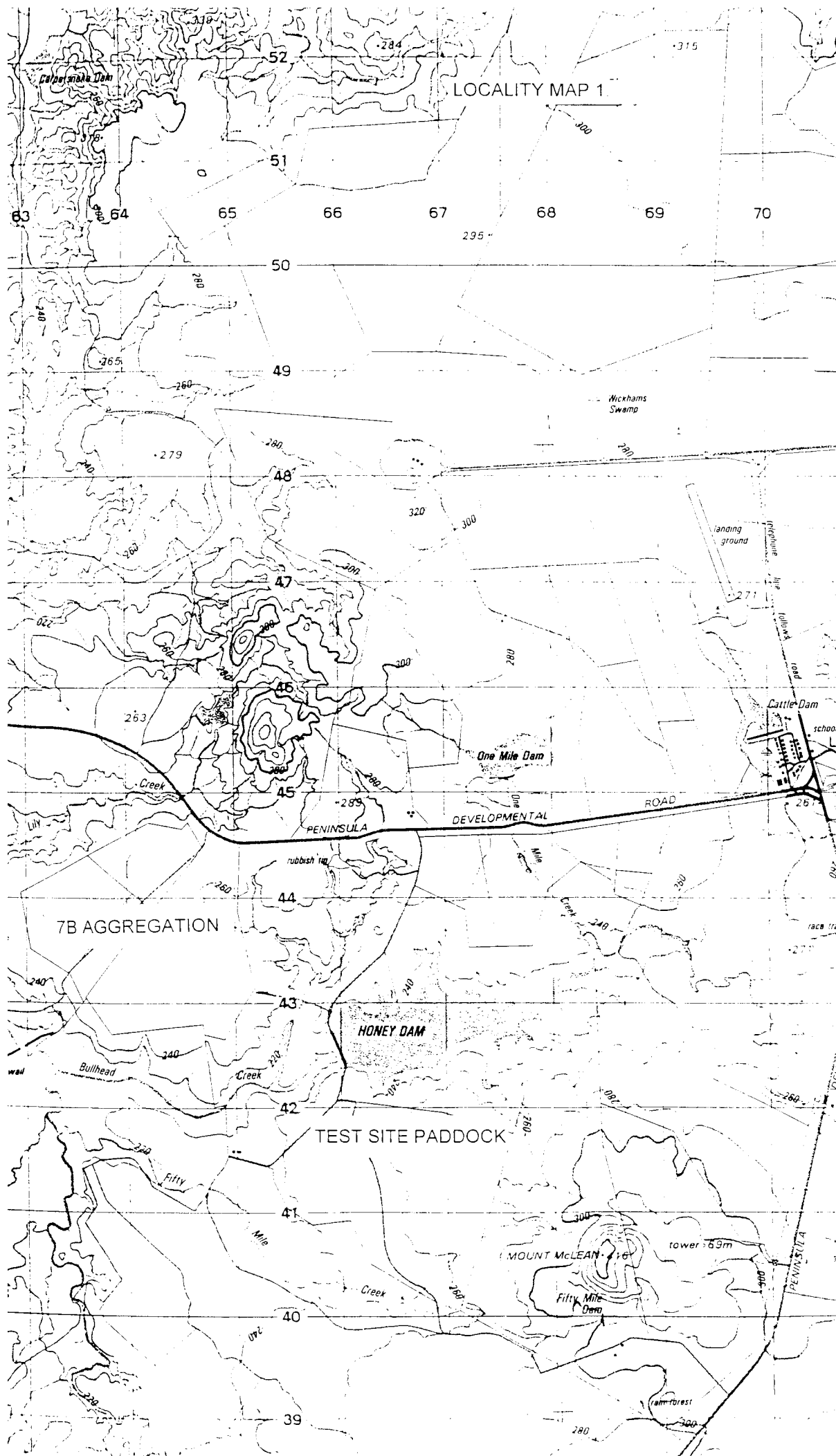
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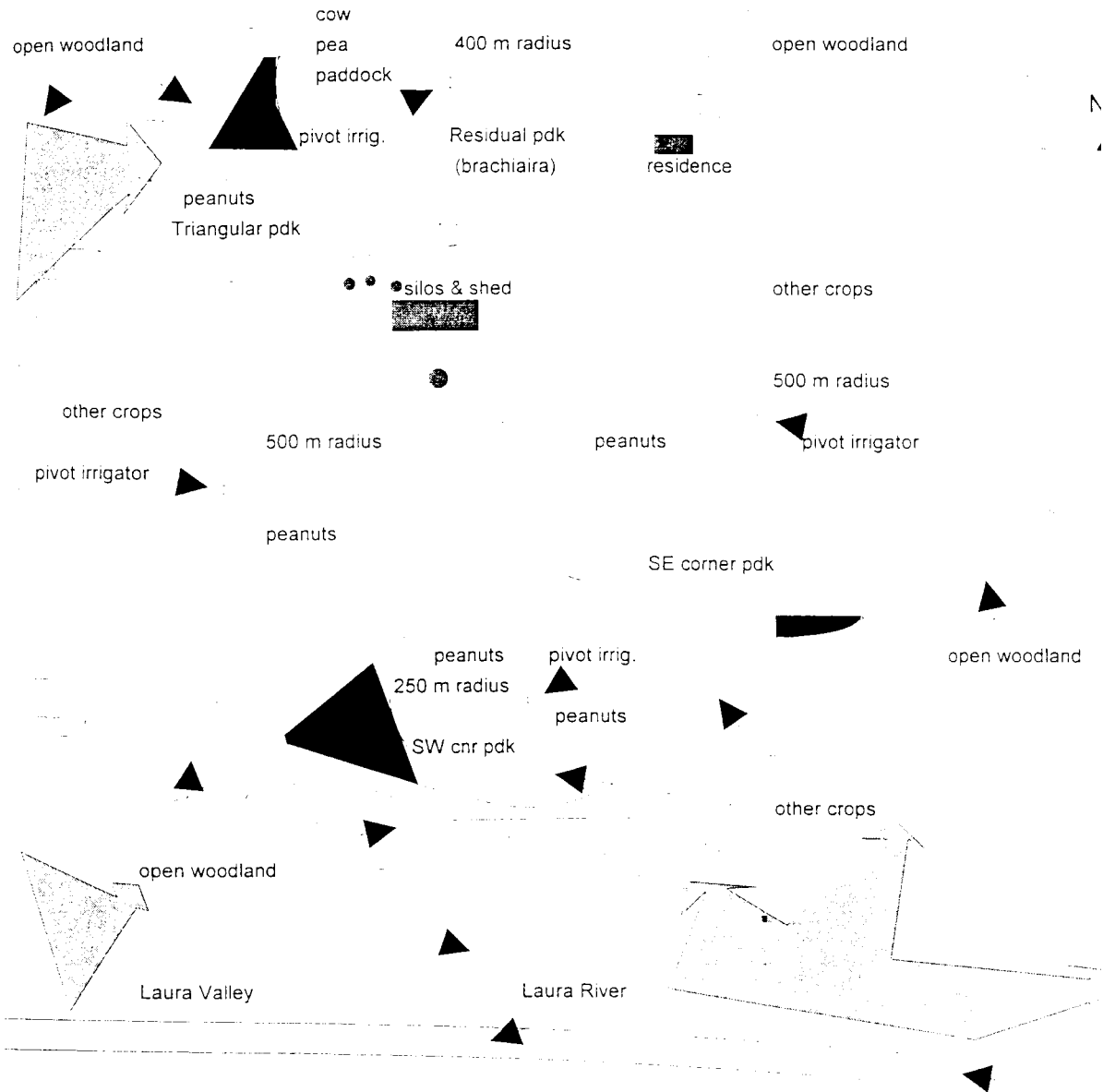
INDERBITZIN

LOCALITY MAP 2  
7B AGGREGATION

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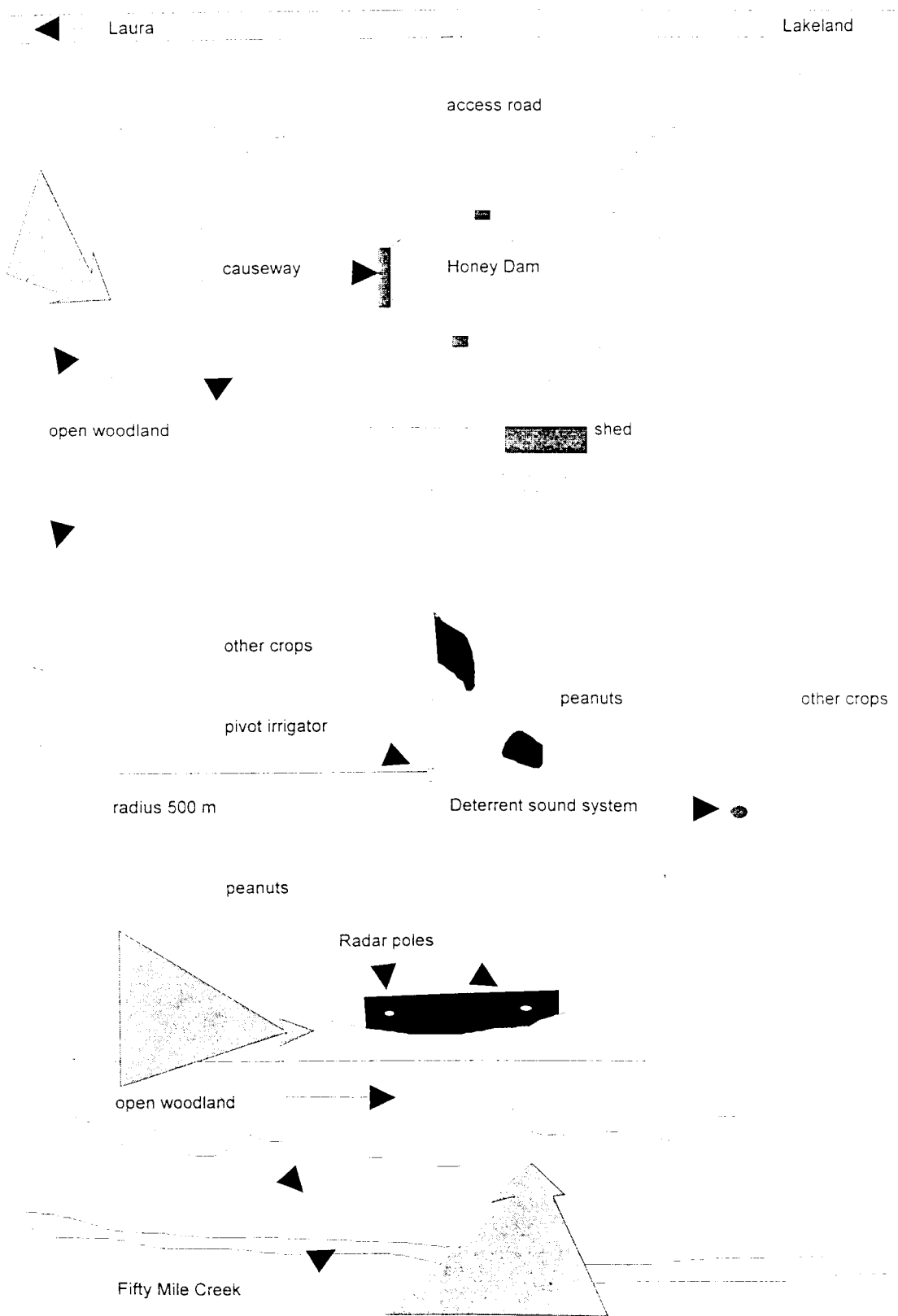
 DAMAGED PEANUT CROP

 OPEN WOODLAND

 INFRASTRUCTURE

 COCKATOO ENTRY

NOT TO SCALE



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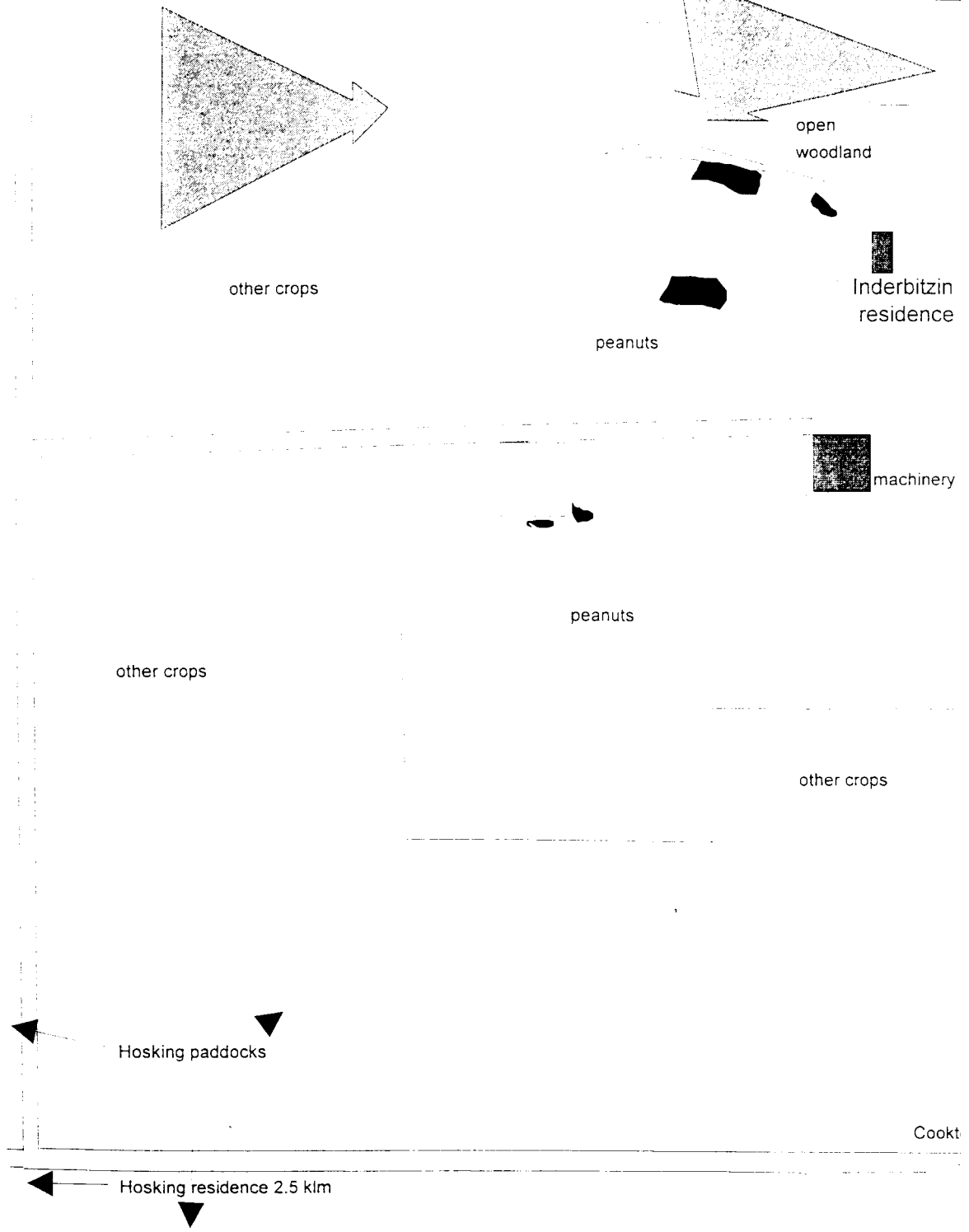
-  DAMAGED CROPS
-  OPEN WOODLAND
-  INFRASTRUCTURE
-  INFRASTRUCTURE
-  COCKATOO ENTRY

NOT TO SCALE





INDERBITZIN

LOCALITY MAP 4  
HOME PADDOCKS

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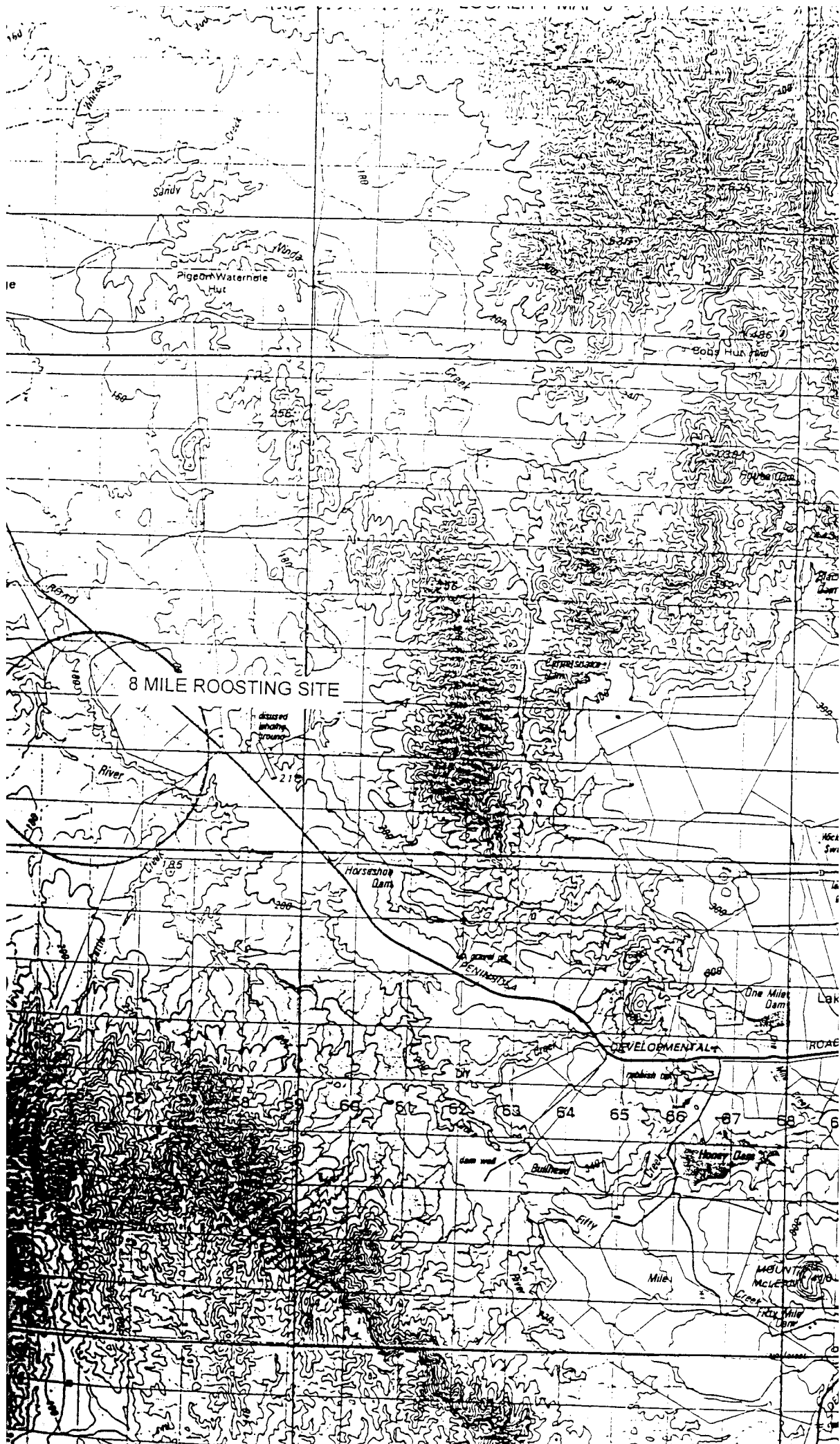
Legend:

-  DAMAGED CROPS
-  OPEN WOODLAND
-  INFRASTRUCTURE
-  COCKATOO ENTRY

Jeffre:  
Ander  
farm

Lakeland 3 km

NOT TO SCALE



8 MILE ROOSTING SITE

Sandy

Pigeon Waterhole Hut

Horseshoe Dam

One Mile Dam

Honey Dam

McINTYRE McLEOD

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