Report on ecological impacts on Southern Cassowary of a 22 lot subdivision at Mission Beach (Lot 2 on RP 732173) for the Planning & Environment Court at Cairns

Southern Cassowary (*Casuarius casuarius johnsonii*). QPWS (2001)

Dr Graham Harrington

8 February 2006

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INTRODUCTION

1. This report considers the ecological impacts on Southern Cassowary (*Casuarius casuarius johnsonii*) of a 22 lot subdivision at Mission Beach (Lot 2 on RP 732173) for the Planning & Environment Court at Cairns (No 232 of 2005).

2. The report is has been prepared at the request of one of the appellant's, the Community for Coastal and Cassowary Conservation Inc ("**C4**"). I am not receiving any payment or other remuneration for preparing this report.

3. My resume is set out in the Appendix. My PhD in 1965 related to the ecotypes of pasture grasses. Since 1986 I have studied rainforest ecology with particular emphasis on the fate of large seeded trees. This work was summarized in a book chapter in which I identified tree species for which cassowaries are the only known disperser and thus would be threatened by the absence of cassowaries (Harrington *et al* 1994). During 1998-2000 I chaired the Cassowary Scientific Advisory Committee, which assisted the Queensland Parks & Wildlife Service in preparing the *Recovery Plan for the Southern Cassowary 2001-2005* (QPWS 2001).

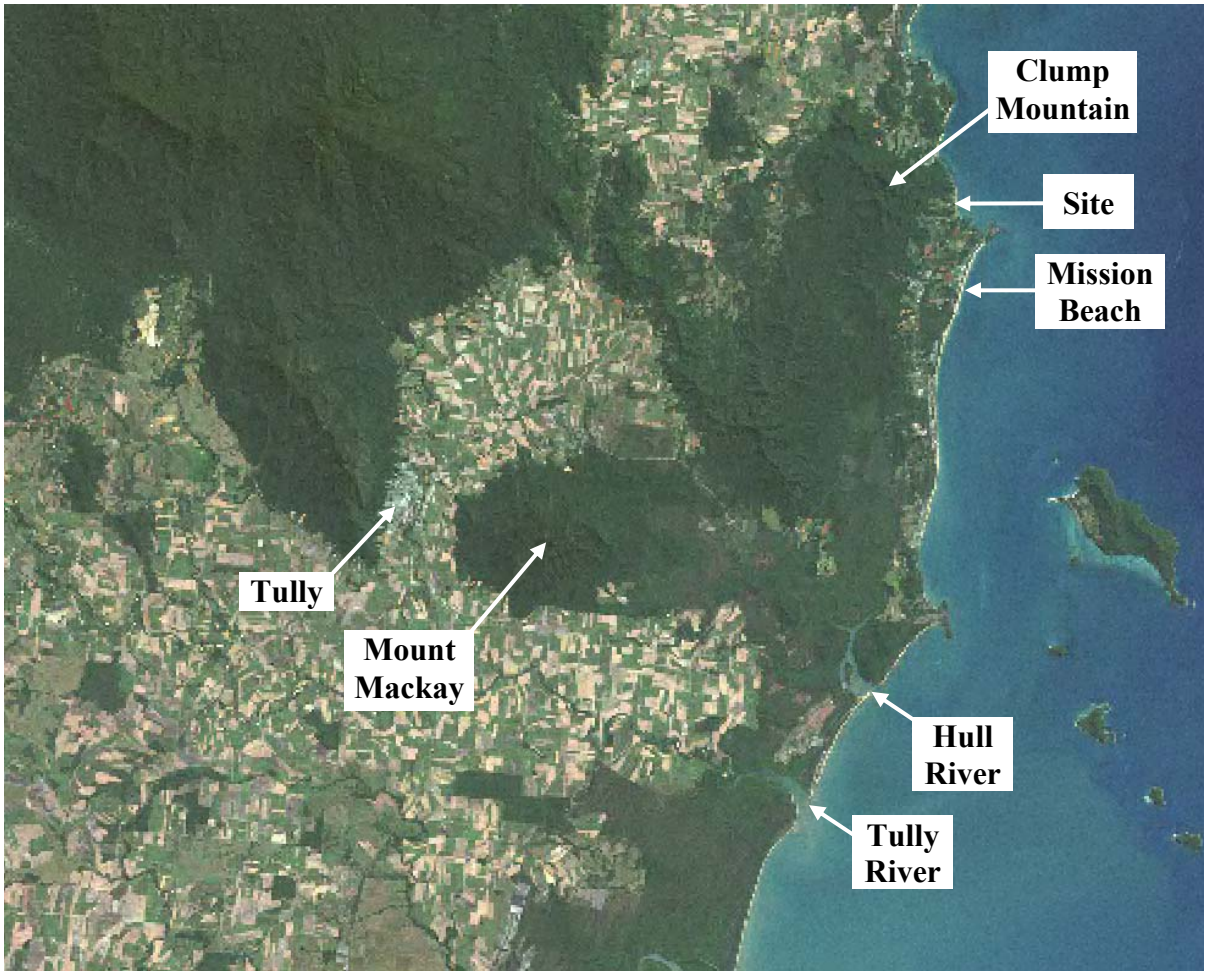
4. I have been provided with and read a copy of the Planning and Environment Court's Guidelines to Expert Witnesses. I am conscious that I am not an advocate for any party and that my primary role is to assist the Court.

THE SITE

5. The land the subject of the development application is 42.58ha in area. It is partially cleared but retains 29.76ha of remnant rainforest. I inspected the site from the southern boundary in October 2005. The site is shown in the following aerial and satellite photographs.

Satellite photograph showing the locality of the site

Satellite photograph showing the region of the site



Aerial photograph of site looking westerly (ca 2003)

6. The regional setting of the site contributes to its significance for the Southern Cassowary. The site is adjacent to the larger area of important habitat for Southern Cassowary in the Clump Mountain National Park to the West and extending South to the Hull River and Mount Mackay. The satellite photographs above show the extensive areas of lowland forest (previously habitat of the highest class for the Southern Cassowary) that have been cleared for agriculture. They also demonstrate that the remnant forest in this area is effectively an island and that the Mission Beach/Clump Mountain/Mount Mackay cassowary population is isolated.

7. The site is located within the Wet Tropics Bioregion in the vegetation classification used in the *Vegetation Management Act 1999* (Sattler and Williams, 1999). As shown in the map on the following page, most of this remnant rainforest is mapped as Regional Ecosystem ("**RE**") 7.12.40 (Closed vineland of wind-disturbed vine forest, on granites and rhyolites). This RE is classified as "of concern" under the *Vegetation Management Regulation 2000*. A large portion of the remnant vegetation on the site is also mapped as RE 7.12.1 (Simple to complex mesophyll to notophyll vine forest on moderately to poorly drained granites and rhyolites of moderate fertility of the moist and wet lowlands, foothills and uplands), which is classified as "not of concern".

8. The RE map on the following page shows a small area of remnant vegetation in the southeast corner of the land, where Lot 3 and Lot 4 are located in the proposed layout. This was an area of RE 7.8.1 (Complex mesophyll vine forest on very wet, well drained basalt lowlands). This vegetation appears to have been cleared.

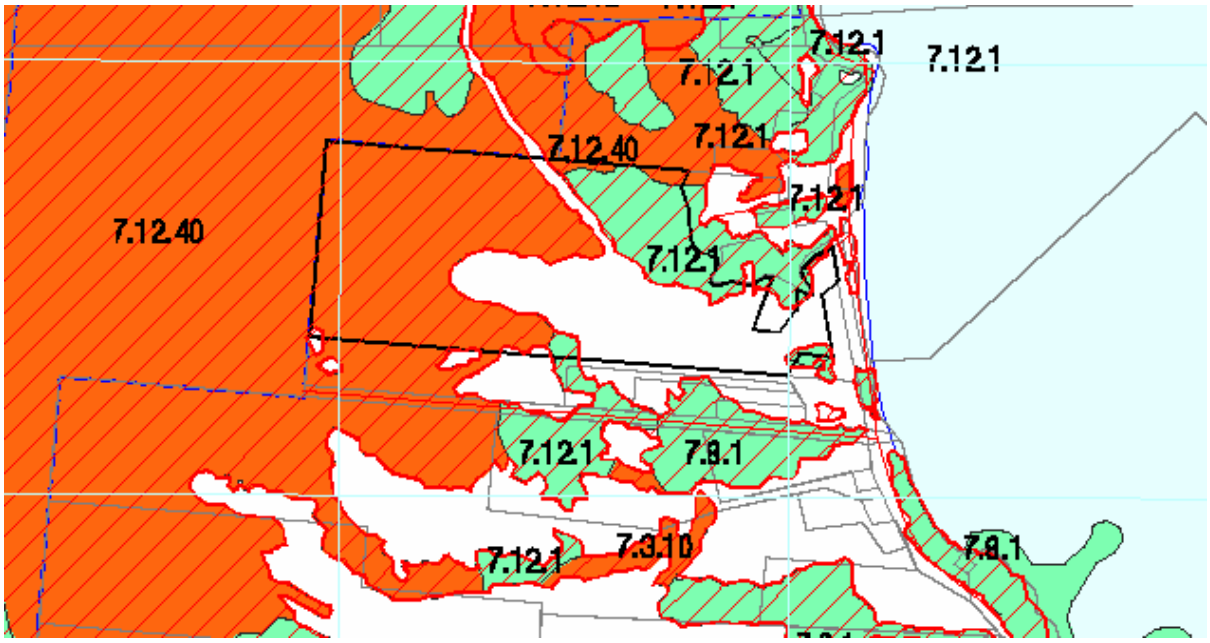
9. The remnant vegetation on the site (including the cleared areas on Lot 3 and Lot 4) is mapped on the RE Map as "essential habitat" for a species listed as threatened under the *Nature Conservation Act 1992.* The relevant species for this mapping is the Southern Cassowary.

10. The land was included in the Rural Conservation Zone under the *Johnstone Shire Planning Scheme 1997* and is included in the Rural Zone (Rural Conservation Precinct) under the *Johnstone Shire Planning Scheme 2005*.

11. The land was mapped as *Preferred Dominant Land Use – Conservation* on the Strategic Plan of the *Johnstone Shire Planning Scheme 1997*. One of the criteria for such a designation in section 5.1.1 of the Strategic Plan is that the land represents "a desired habitat system for the Shire and includes significant cassowary habitat (on the basis that this habitat carries with it the habitat of a diverse range of other species)." I am instructed by the lawyers representing C4 that I am not permitted to suggest what legal interpretation should be given to the terms used in the Strategic Plan but that I can attempt to assist the Court to determine the facts that are relevant to applying the Strategic Plan. If the term "significant cassowary habitat" in the Strategic Plan is given its plain meaning (and I leave it to the Court to determine this point), I understand it to mean an area where the Southern Cassowary naturally lives and grows, either permanently or seasonally, and the loss of which would impact negatively on the number of cassowaries, which could survive in the Shire. As I will explain further below, in my opinion the remnant rainforest on the site is significant cassowary habitat but that the cleared area on the site (where the houses are proposed to be built) is not

significant cassowary habitat, even though cassowaries may regularly walk across the cleared area.

Extract from 2003 regional ecosystem map showing site boundaries in black[1]



Key to RE Map

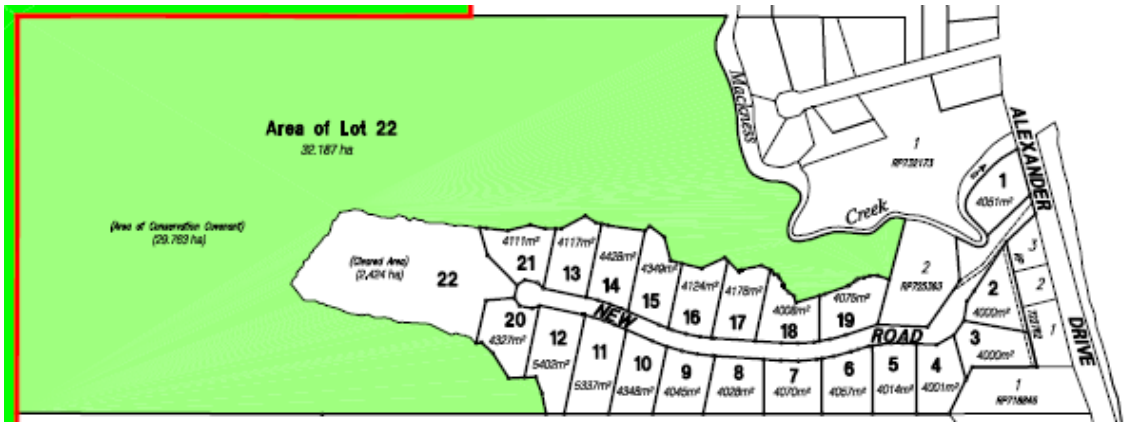
2003 Remnant endangered regional ecosystem
Dominant
Sub-dominant
2003 Remnant of concern regional ecosystem
Dominant
Sub-dominant
2003 Remnant not of concern regional ecosystem
Non-remnant
Plantation Forest
Dam or Reservoir
2003 Remnant Vegetation Cover (RVC)
Essential Habitat
Area identified as essential habitat by the EPA for a specie of wildlife listed as endangered, vulnerable, near threatene or rare under the *Nature Conservation Act 1992*.
State Wildlife Corridor
Areas identified as links between large remnant tracts of vegetation including riparian areas.
Subject Lot
Certified Map Amendment area
Roads
© MapInfo Australia Pty Ltd 2003
Bioregion boundary
National Park, Conservation Area State Forest and other reserves
Cadastre line
The maximum spatial error of parcels extracted for this map from the Digital Cadastral Data Base(DCDB) range from: 14m to 251m at a 95% confidence level. Property boundaries shown are provided as a locational aid only.
Towns

[1] Obtained from the Environmental Protection Agency website at http://www.epa.qld.gov.au (12/1/06).

THE PROPOSED DEVELOPMENT

12. The cleared area on the land is proposed to be divided into 22 lots (21 lots plus balance). 21 lots are of approximately 4,000-5,400m^2 (0.4-0.5 ha) and arranged either side of a central roadway running westwards from Alexander Drive. Lot 22 is much larger, having a cleared area of 2.424ha and vegetated area of 29.763ha (the latter area is proposed to be subject to a Conservation Covenant). Lot 22 is situated at the end of the road and extends as a bay into the remnant rainforest (i.e. it is bordered by rainforest to the south, west and north). The vegetated area on Lot 22 that is proposed to be retained is shown in green in the following map.

Map showing layout of proposed development



13. The developers have proposed to construct a "cassowary-proof" fence to separate the remnant rainforest from the developed area and to put a conservation covenant over the remnant rainforest. The conditions of the negotiated decision notice required a fence "to a minimum standard of 900mm chain mesh with a white sight wire set 100mm above the chain mesh" around the Conservation Area on Lot 1. I am not able to locate a similar condition in that approval for fencing on other lots although the original decision notice had conditions relating to further fencing.

14. A decision concerning the proposed development under the *Environment Protection and Biodiversity Conservation Act 1999* on 1 April 2005 included a condition that:

> "Prior to any works commencing on the subdivision and associated infrastructure, a 1200mm-1500mm chain mesh fence, with a white "sight wire" set 100mm above the chain mesh, must be installed and maintained along the northern boundaries of lots 21, 13 to 19 and the southern boundary of the cleared portion of lot 22 to prevent interactions between Southern Cassowary (*Casuarius casuarius johnsonii*) habitat and human habitations."

15. I am unclear on exactly where the western end of the proposed cassowary fence will be located on Lot 22. If it ends on the border of Lot 21, that would leave a great area unfenced around the cleared area of Lot 22 and Lots 20 and 12. If it continues around the cleared area of Lot 22 (from the border with Lot 21) to the boundary of Lots 20 and 12, then there is still a considerable gap in the fence. It may be that it is proposed to be constructed along the entire boundary of the remnant vegetation bordering Lots 12-21, plus the boundary of the vegetation with the cleared area on Lot 22, although this does not seem to reflect the wording of the conditions.

16. Whatever the exact location of the western end of the proposed cassowary fence, I understand that its height is now proposed to be 1,200-1,500mm high with a white sight wire 100mm above. Queensland Parks & Wildlife Service ("**QPWS**") has found such a fence to be effective in preventing cassowaries from entering private land elsewhere (S. Sullivan, Qld. EPA, personal communication).

17. I understand that a limited amount of revegetation is also proposed for Lot 1. No revegetation is proposed for the cleared area of the proposed Lot 22. The existing remnant rainforest on Lot 22 will not be cleared and will be protected by a Conservation Covenant.

18. A further matter that is of relevance to the potential ecological impacts (particularly to cassowary) of the proposed development is the controls that may exist for cats and dogs in the 22 new house lots that are proposed. As I understand the proposal and the conditions of approval, there is no intention to limit the ability of purchasers to own cats and dogs. The cassowary fence, noted above, is designed to control cassowaries not cats or dogs, but cats and dogs can walk around, burrow under or climb over such a fence. I note that Johnstone Shire Council's *Local Law No 7 (Keeping and Control of Animals)* places requirements on dog owners to fence their yards and to prevent their dogs from wandering or escaping from their land. The policy for this local law requires that yards greater than 600m^2 must have a minimum area of 300m^2 fenced, and that the fence must be "constructed of strong and firm materials and designed in such a way as to prevent the animal from escaping over, under or through the fence." There are minimum height requirements for the fence of 1m for dogs less than 10kg and, unless otherwise approved, 1.8m for dogs over 10kg. As far as I am aware there are no fencing requirements for cats.

ECOLOGY OF THE SOUTHERN CASSOWARY

19. A photograph of an adult Southern Cassowary is shown on the front cover of this report.

20. The Southern Cassowary is classified as "endangered" under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth). The Wet Tropics population of the Southern Cassowary is also classified as "endangered" by the *Nature Conservation (Wildlife) Regulation 1994* (Qld) (QPWS 2001).

21. The Southern Cassowary inhabits rainforests in Queensland's Wet Tropics and on Cape York (Marchant and Higgins 1990). The densest populations of cassowaries are believed to be in the lowland rainforests of the Wet Tropics before they were cleared for agriculture (Crome & Moore 1988). At least 57% of the original lowland forests in the Wet Tropics have been cleared for agriculture with much of the remainder highly fragmented (Winter et al 1987). It is reasonable to assume there has been at least an equivalent reduction in cassowary numbers on the coastal lowlands to the area of habitat lost and fragmented (i.e. approximately 85%).

22. Mission Beach is accepted as high quality habitat for Southern Cassowaries and its population density is probably higher here than other parts of the Wet Tropics (Crome and Moore 1998, Benntrupperbaumer 1998).

23. Although Southern Cassowaries are essentially forest birds, they are not restricted to rainforest but will enter mangroves, Eucalyptus systems and Melaleuca swamp systems when food is available (Benntrupperbaumer 1998). They will enter open grassland areas but do not normally feed there nor spend more time than necessary to cross to adjacent forest habitat (Crome & Moore 1998).

24. Southern Cassowaries are principally fruit eaters, which they usually pick up from the ground. However, they are also known to eat carrion, insects, worms and fungi (Crome & Moore 1998, Benntrupperbaumer 1998). They digest the flesh from the fruits but defecate the seeds intact. This makes cassowaries an important agent in seed dispersal.

25. They regularly visit farms and gardens within their home range, if they can find food there. This can bring them into contact with dogs and vehicles, which has caused injuries and fatalities (Moore & Moore 1999b, QPWS 2001).

26. Southern Cassowaries are solitary and territorial animals (Marchant & Higgins 1990). Male and female territories can overlap (Benntrupperbaumer 1998). At times of food shortage they can wander more widely and this creates the conditions for fighting for food and territory. Territory boundaries are probably fairly fluid (Moore & Moore 1999b) in response to constantly changing climatic conditions and forest phenology, which causes fluctuations in both food availability and the numbers of birds competing for those resources.

27. In the Mission Beach area the size of cassowary territories varied from 52 to 136ha (mean 75 ha). However, due to overlap in territory between birds the density of adult cassowaries was recorded as 2.5–3.8 birds per 100ha (Benntrupperbaumer 1998).

28. The Southern Cassowary is a "keystone" species in that it is the **only** disperser of the seeds of some tree species and a major disperser of most large-seeded trees and vines (Harrington *et al* 1994). Thus the regeneration of the rainforest is critically affected by the presence of cassowaries and their decline would have a long-term deleterious effect on the status of the forest.

29. Although cassowaries are large, robust, long-lived birds their social organization and longevity make them vulnerable to localised extinction. This is particularly so in an area such as Mission Beach/Clump Mountain/Mount Mackay, which is effectively an island of remnant forest surrounded by agricultural land, with crocodile infested rivers to the south and a dangerously busy highway to the west. The passage of cassowaries between this island and nearby rainforest habitat would be unnaturally small. The population of cassowaries in this area is strictly limited because they are territorial and solitary. Being large birds they need large territories, the size of which limits the number of birds in a given area. Juvenile birds can only survive if they can find a territory. In a small isolated area such as Mission Beach and surrounds, the number of territories is also small and they can be dominated by adult birds for many years thus preventing any effective reproduction. The young birds are prevented from searching further afield by the hostile land encircling them. The adult birds can become geriatric and the population can become non-viable possibly due to genetic simplification (inbreeding). It is the inherent vulnerability of a small population that is operating here.

30. Southern Cassowaries are an icon and contribute substantially to the tourist attraction of the area. It is, thus, in the community's interests to maintain the cassowary population.

31. The essence of good management for the Southern Cassowary, as identified in the QPWS Recovery Plan for this species, is to maximize the forested area in order to support as many cassowary territories as possible and to keep cassowaries away from hunters, dogs, motor vehicles and artificial food (QPWS 2001).

SIGHTINGS OF SOUTHERN CASSOWARY ON THE SITE

32. I am informed by Mr and Mrs Suddaby, neighbours whose house overlooks the cleared part of the site, that they have observed cassowaries walking across the cleared area identified for development on many occasions. The following photograph was taken on their land in 2005 by Mr Suddaby of a cassowary and its chick walking towards the development site.

Photograph of adult male Southern Cassowary and chick moving across neighbouring land at north-eastern end of the site

33. Another neighbour, Mrs Shane Hunter, has also reported many instances of cassowaries crossing the cleared area. She has lived on the neighbouring land for the past 5 years and her observations are set out in a statement by her dated 30 January 2005. She reports that it is usually single birds that she has observed but she has observed a male with chicks at foot. She also reports that the birds frequently feed on a neighbour's lychee and mango fruit trees when they are bearing fruit. The number of cassowaries moving across the site varies at different times of the year. In November-December (when the fruit trees are in season) she reports seeing cassowaries every day. She has also seen cassowaries near a seasonal creek that adjoins the development site and her land.

DISCUSSION

34. **Conclave Report**. On 18 January 2006 I attended an expert conclave with Mr Cameron Slack, Mr H Dillewaard and Mr S Sullivan. That meeting resulted in an agreed expert report ("**the Conclave Report**"). The matters agreed upon included the following:

> "A 2m fence would ensure that dogs from the development are excluded from the remnant vegetation." (Paragraph 11)
>
> "the density of housing in terms of increasing the household numbers from 6 to 21 lots would not impact on cassowary habitat in adjacent areas to any greater extent although it was recognised that there is a risk of disturbance in general from human habitation." (Paragraph 12)
>
> "[if certain measures such as fencing] were implemented, then the development could meet the performance criteria in maintaining viable habitat for cassowary." (Paragraph 19)

35. On re-examination of this proposal I have realized that extent of the proposed fencing is less clear than I believed it to be at the Conclave (see paragraphs 13-15 above). Furthermore, I believe the wording does not place as much emphasis on the "risk of disturbance in general from human habitation" as I would have liked. Even assuming the fence runs the entire length of the boundary of remnant vegetation, I feel it is necessary to emphasise that whilst a 2m chain-link fence would prevent a dog from immediately following a cassowary, when it could see one through the fence, it would not reduce the hazards resulting from a general increase in dogs in the area. It is recorded that dogs escape from their residences and form packs, which hunt and kill cassowaries (QPWS 2001, Crome & Moore 1988). This also applies for dogs fenced in accordance with *Local Law No 7 (Keeping and Control of Animals)*. Domestic dogs that escape from their yards would be able to pass around the end of the cassowary fence, however situated, and enter the forest area. I have also revised my opinion regarding the impact of the number of residencies on this development. Although the additional effects could be mitigated by a high and robust fence, I believe impacts on Southern Cassowaries and their habitat remain substantial and are proportional to the number of houses established. I will detail my concerns about these impacts further in the following paragraphs.

36. **Current Use of the Proposed Development Area by Cassowaries**. As noted earlier, in my opinion the remnant forest on the site is essential habitat for cassowaries but the cleared land is not so. The cleared area is currently acting as a partial buffer between the cassowaries in the rainforest and the gardens to the south of the area. Cassowaries do not preferentially leave the protection of the forest. Nonetheless, cassowaries do cross the cleared area from time to time (see above). They are using the area to travel from one side of the forest to the other or to enter the gardens of the existing habitation. Use of gardens by cassowaries is undesirable and should be discouraged because it puts them at risk from dogs, it tempts people to feed them, and they may become aggressive towards humans (QPWS 2001). Putting houses on this cleared area would remove this buffer.

37. **Land Zoning**. One question posed by this development is whether there is any substantial difference to the conservation of Southern Cassowaries or other wildlife values if the cleared area of the land is converted from Rural

Conservation to Rural Residential. Section 5.1.1.2 of the Strategic Plan identifies that maintaining the "viable functioning of cassowary habitat" will be one of the criteria used to assess the impact of any proposed development. There can be no doubt that, as the human population both increases overall and increases in density, the threat to, and impact on, the cassowary population and other wildlife in the Mission Beach area is also increasing. The remnant rainforest and its dependent animals in the Mission Beach area are effectively isolated by agricultural land and the Princess Highway (see satellite photo above and Crome & Moore 1998). Such isolation renders the plants and animals inherently more susceptible to local extinction. An example of this happening is the recent extinction of cassowaries from Mount Whitfield on the edge of Cairns. This development proposal, therefore, cannot be viewed in isolation from the overall development environment in Mission Beach. Each development can be argued as posing a very small additional impact on the natural environment but taken in total the pressures on such vulnerable animals as cassowaries will eventually be unsustainable. Land used as Rural Conservation must pose a lesser risk to cassowaries than Rural Residential or other higher density development.

38. **Human Impact on Cassowaries**. The major threats to cassowaries, as recognised in the *Recovery Plan for the Southern Cassowary 2001–2005* (QPWS 2001), are:- habitat loss, forest fragmentation and modification, traffic accidents, visitor impacts, dogs, competition and nest predation by pigs, catastrophic events such as cyclones and disease (Crome & Moore 1990, Crome & Moore 1993, Goosem 1992, Bentrupperbaumer 1998). The Recovery Plan states in relation to dogs (at page 7):

> "Dogs directly affect cassowaries by attacking them, resulting in deaths and injuries, and indirectly through their presence, which affects their feeding, movements and behaviour (Crome and Moore 1988, 1990). Bentrupperbaumer (1998) observed that dog attack was the second most important recorded source of cassowary mortality. Unattended dogs are able to prey on chicks and sub-adults. This is thought to be a significant impediment to recruitment near rural areas and along the edges of residential development. Dogs in packs are known to harass adults until they are exhausted and injure or kill them."

39. These impacts are likely to be strongly correlated with the number of houses that are established. This applies both to this proposed development and the overall situation in Mission Beach.

40. As the remnant rainforest is proposed to be retained by the development, a major impact from the development in my opinion is the potential introduction dogs adjacent to the remnant rainforest. The proposed 1,200-1,500mm cassowary fence and fencing of yards will assist in controlling dogs entering the remnant rainforest. The 2m chain-link fence proposed in the Conclave Report would do a better job in this regard provided it went right around the perimeter of the development, but dogs can burrow under, climb over or walk around fences, so the fencing is unlikely to fully exclude them from entering the remnant rainforest on the land. The nearby presence of dogs will also disturb natural movement and feeding of cassowaries (QPWS 2001). For these reasons there is a substantial difference if the cleared area of the land is retained as rural land or if the proposed development proceeds. The proposed development is likely to have a substantial negative impact on the habitat values of the remnant rainforest and surrounding habitat of the Southern Cassowary by removing buffer areas and increasing the presence of dogs.

41. **Other Impacts from Human Habitation.** Other potential sources of degradation from human habitation associated with the proposed development for cassowaries and wildlife in general are:- hunting by cats and people; dumping of rubbish and garden waste; weeds that escape because people use undesirable plants in their gardens; human recreational activity in the forested area, such as trail-bikes and exercise of dogs; and artificial feeding of wildlife, especially cassowaries. Again, these impacts are likely to be strongly correlated with the number of houses that are established on the land – the more houses the greater the likely impacts.

42. Cats need to be banned because it is not possible to control them. Cats will pose a constant danger to low-nesting birds such as Chowchillas. Mission Beach has one of the few lowland populations of this bird, which is endemic to the Wet Tropics. Furthermore, a list of prohibited garden plants needs to be established and communicated effectively.

43. **Retention of Cassowary Habitat.** The retention of the remnant rainforest on the land, as is proposed to be done under the current development proposal, is essential to maintaining the existing habitat values of the land for cassowaries. Every bit of forest clearance, were it proposed, contributes to the reduction in cassowary numbers. Because territories are quite small in the Mission Beach area (mean 75ha) (Benntrupperbaumer 1998) even small areas of forest clearance are influential. By example if the minimum size for a cassowary territory is 75ha for survival long-term then reduction of the overall forest area by a mere 1ha, if the forest is fully populated, will eventually lead to the death of a cassowary (this is a simplification of what would be a complex process of cassowary movement and fighting for resources but it illustrates the essential point).

44. **Reforestation.** It follows that even small areas of reforestation have the potential to contribute positively to cassowary conservation and an increase in numbers into the future. The revegetation of part of Lot 1 that is proposed is a positive step. Reforestation of areas adjacent to large blocks of forest (as the remnant rainforest on the site is) are particularly valuable because the cassowaries do not have to cross open areas to utilize them. Any significant re-planting and rehabilitation of the cleared area adjacent to the remnant rainforest with local rainforest plant species will assist in maintaining the habitat function of the area to achieve the aims of sections 5.1.1.1 and 5.1.1.2(3) in the Johnstone Shire Strategic Plan.

45. **Forest Shape**. In assessing the effects of deforestation and restoration of cleared areas, it is necessary to appreciate how the ratio of length of forest edge to the area of forest affects the habitat value for wildlife. Large areas of forest are richer in species than smaller areas (Williams & Pearson 1997). Furthermore a given area of rainforest will tend to support more species if the edge is shorter rather than longer (i.e. a circle is the most efficient shape and a very wavy, crenellated margin reduces the ability of the same unit area to support as many species). It follows that holes and bays cleared within the rainforest have a deleterious effect on the ability of the forest to support wildlife (Williams & Pearson 1997). If Lot 22 on the development plan were reforested it would eliminate the “bay” in the rainforest, facilitate cassowary movement and contribute to the total food resources of cassowaries and other wildlife.

46. **Relative Impacts of the Number of Houses**. Should planning permission be granted for developing this area for residential purposes the question comes down

to an assessment of the relative impact of 2, 6 or 22 house lots to the achievement of the conservation aims in the Strategic Plan. Obviously the factors, which have a deleterious effect on cassowaries listed above are directly proportional to the number of residencies established. This applies to this particular proposed development and to the Mission Beach area overall. Basically it comes down to more dogs, more cats, more cars, more garden plant escapes and more humans to disturb the habitat. This is inconsistent with the maintenance of cassowary habitat. The fewer the number of house lots, the smaller the impacts on cassowary are likely to be.

DECLARATION

I, Graham Harrington, have made all the enquiries, which I believe are desirable and appropriate, and that no matters of significance, which I regard as relevant, have, to my knowledge, been withheld from the Court.

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APPENDIX

CURRICULUM VITAE - Graham Norman HARRINGTON

DATE OF BIRTH: 18 May 1935

NATIONALITY: Australian

RECENT POSITIONS: 1997 – 2006. Research Fellow
Tropical Forest Research Centre, Commonwealth Scientific and Industrial Research Organisation, (CSIRO), Sustainable Ecosystems
PO Box 780, Atherton, Q 4885, Australia.

Past President, Royal Australasian Ornithologists Union (Birds Australia)

Past Councillor for the Pacific Region, BirdLife International.

1998-2000 Chairman, Cassowary Scientific Advisory Committee, Queensland Parks and Wildlife Service.

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EDUCATION: 1961 B.Sc. (Hons.) University of Wales, U.K..
1965 Ph.D. University of Wales

SPECIALIST EXPERTISE:

Research planning and organisation
Management of grazing systems
National Park and Conservation Management
Surveys and audits of ecosystems
Sustainable use of tropical forests and savannas
Animal and plant dynamics.

EMPLOYMENT HISTORY:

1997-2006 **Hon. Research Fellow, CSIRO Tropical Forest Research Centre, Atherton, Queensland.**

Collaborating on a model of rainforest seed dispersal by birds and mammals. Collaborating on a study of fire impact on sedentary birds in Spinifex grasslands. Working on improvement of bird survey methodology.

1998-2000 **Chairman of the Scientific Advisory Committee on the Southern Cassowary to the Environmental Protection Agency**.

This project involved chairing the scientific advisory committee to the EPA/QPWS in the preparation of the *Recovery Plan for the Southern Cassowary 2001-2005* (QPWS 2001).

1994-1997 **Leader of the Rainforest Boundary Dynamics Project within the Cooperative Research Centre for Tropical Rainforest Ecology and Management.**

This project involved the collaborative work of 12 scientists from James Cook University and CSIRO in assessing the conservation implications of the management options for the ecosystems affected by fire and high rainfall at the rainforest boundary in North Queensland. Many endemic species and sub-species have evolved in a limited area of habitat that is highly responsive to fire and grazing management.

1986 - 1994 **Director, CSIRO Tropical Forest Research Centre, Atherton, Australia.**

Scientific leader of 11 Research Scientists and 16 support staff concerned with the ecology of tropical rainforest and its response to disturbance.

Leader of an Australian team that designed a multi-sectoral Research and Management Program for Papua New Guinea entitled "Economic, Ecological & Sociological Sustainability of Tropical Rainforest Use." This was formally adopted by PNG Government leading to appointment as leader of an I.T.T.O funding assessment team.

Personal research program in the implications of forest fragmentation to biodiversity and ecological processes.

1984 - 1986 **Program leader of the Rangelands Research Unit in the CSIRO Division of Wildlife and Rangelands Research.**

The program was concerned with the functioning and Management of Semi-arid Australian environments. A team of 11 scientists covered the disciplines of Remote Sensing Technology, Soils, Fire Ecology and Socio-economics. These scientists worked in an interdisciplinary manner to produce results and techniques useful for land management and administration.

1973 - 1984 **Senior Research Scientist, CSIRO Division of Land Resources Management.**

Leader of Semi-Arid Woodlands Management Project. Three scientists studied the reasons for, control of and the economics of shrub increase in semi-arid pastoral land.

1965 - 1972 **Officer-in-charge, Muko Range Experimental Station, Ministry of Animal Industry, Uganda.**

Developed grazing management and weed control strategies for an 8000 sq. km ranching scheme in an area cleared of Tsetse Fly, including grazing ecology, fire ecology shrub dynamics and hydrology studies.

Developed a management scheme for a savanna National Park based on research into seasonal use of vegetation types by large herbivores and the Impact of fire and browsing on tree regeneration.

INVITED POSITIONS:

First editor of the Australian Rangeland Journal.

Member of the Organising and Program committees, 2nd International and Rangeland Congress, Adelaide, 1984.

Royal Australasian Ornithological Union (Birds Australia) Councillor 1995-1998 National President 1998-2001.

BirdLife International, Councillor representing the Pacific Region, 2000-2004.

Birds Australia/Environment Australia Bird Atlas Regional Organiser, North Queensland. 2000-2004.

Invited speaker at the following conferences:-

International Botanical Congress, Sydney, 1981
Browse in Africa Conference, Addis Ababa, 1981
International Goat production & Disease conference, Tucson, 1982.
South African Botanical Congress, Johannersburg, 1983
2nd International Rangeland Congress, Adelaide, 1984
Int. Symposium on African Wildlife, Uganda, 1986
International Conference on Rainforest Regeneration, Venezuela, 1986
IUFRO Symposium, Harvesting and Silviculture for Sustainable Forestry in the Tropics, Kuala Lumpur, 1992
International Grassland Congress, Australasia, 1993

World Heritage Tropical Forests Conference, Cairns, Australia 1996
Fire in the Management of northern Australian pastoral lands, Townsville, 1996

PROFESSIONAL ORGANISATIONS:

Australian Rangeland Society
Ecological Society of Australia
Royal Australasian Ornithologists Union
International Society for Ecological Economics

PUBLICATIONS

Summary

66 published manuscripts, eight specialist reports and two books.

Books

Harrington,G.N., Wilson, A.D. & Young, M.D. (1984). *Management of Australia's Rangelands* (East Melbourne: CSIRO, Melbourne).

Morris, B., Sadler, T and Harrington G. N. (1992). *Our Rainforests and the Issues* (East Melbourne: CSIRO, Melbourne).

Refereed Publications (Rainforest only)

Harrington, G.N**.** and Sanderson, K.D. (1994). Recent contraction of Wet Sclerophyll Forest in the Wet Tropics of Queensland due to nvasion by rainforest. Pacific Conservation Biology. 1 : 319-27.

Lott, R. H., Harrington, G.N., Irvine, A. K. and McIntyre, S. (1995). Density-dependent seed predation and plant dispersion of the tropical palm *Normanbya mormanbyi.* Biotropica 27: 87-95.

Laurance W.F. and Harrington, G.N. (1997). Ecological associations of feeding sites of feral pigs in the Queensland Wet Tropics. Wildlife Research. 24: 591-607.

Harrington, G.N., Irvine, A. K., Crome, F. H. J., and Moore, L. A. (1997). Regeneration of large-seeded trees in rainforest fragments: a study of higher-order interactions in Tropical Forest Remnants: Ecology, Management and Conservation of Fragmented Communities. ed. W. F. Laurance and R.O Bierregaard. University of Chicago Press pp 292-303.

Chapman, A and Harrington, G.N. (1997). Responses by birds to fire regime and vegetation at the wet sclerophyll/tropical rainforest boundary**.** Pacific Conservation Biology. 3:213-320.

Bradford, M. G. and Harrington, G.N., (1999). Survey of Yellow-bellied Glider *Petaurus australis reginae* sap-feed trees from the air and on the ground near Atherton, north Queensland. Wildlife Research 26.

Harrington, G.N., Thomas, M. R., Irvine A. K. , Sanderson, K. D. and Bradford, M. G. (2000). Structure and plant species dominance in north Queensland Wet Sclerophyll Forests. Proceedings Royal Society of Queensland 109:59 –74.

Harrington, G.N. & Debus, S.J.S. (2000). Dietary items of the Rufous Owl *Ninox rufa* on the Atherton Tableland, North Queensland. Australian Birdwatcher 18: 251-252.

Harrington, G.N., Freeman, A.N.D. & Crome, F. H.J. (2001). The effects of fragmentation of an Australian tropical rainforest on populations and assemblages of small mammals. Journal of Tropical Ecology. 17: 225-240.

Dennis, A. J., Lipsett-More, G. J., Harrington, G.N., Collins, E. A. and Westcott, D. A. (2005). Seed predation, seed dispersal and habitat fragmentation: does context make a difference in tropical Australia? **In:** Seed Fate: predation, dispersal and seedling establishment. Eds. P.M. Forget, J.E. Lambert, P.E. Hulme, and S.B. Vander Wall. Pp.117-136. CABI Publishing, Wallingford.

Book Chapters

Harrington, G.N., Irvine, A. K., Crome, F. H. J., & Moore, L. (1994). Regeneration of Large-seeded Trees in Australian Rainforest Fragments: a Study if Higher-Order Interactions. **In:** Tropical Forest remnants: Ecology, Management and Conservation of Fragmented Communities. Eds. W.F. Laurance & R. O. Bierregaard. The University of Chicago press.

Conference papers

Harrington, G.N. (1989). Concept for a study of the ecological and economic sustainability of rainforest logging in Paupa New Guinea IN Funding priorities for research towards Sustainable Management of Biodiversity Resources in Tropical Asia. pg 127-130 NSF/USAID, Bangkok.

Harrington, G.N. (1989). Generalised research framework for designing economically, socially and ecologically sustainable timber harvesting from tropical rainforest - a discussion paper IN Ecological and Economic Sustainability of Tropical Rainforest Management. UNESCO, Paris, Sept. 1989.

Harrington, G.N. (1992). Indicators of Sustainability in tropical rainforest management. Proceedings "Harvesting and Silviculture for Sustainable Forestry in the Tropics". IUFRO, Kuala Lumpur, Malaysia.

Arlidge, S., Valentine, P.S.V. and Harrington, G.N. (1997). Purpose and Practise of burning near Wet Sclerophyll Forests. In: Fire in the Management of Northern Australia Pastoral Lands. eds. A. C. Grice and S. M Slatter. Tropical Grassland Society Occasional Publication No. 8. pp 65-67.