Mosquito Impact Assessment Report

Proposed Integrated Residential Development
Angels Beach North

Lot 208 DP 851318
For
North Angels Beach
Development Pty Ltd

C/- S.J. Connelly Pty Ltd
64 Ballina Street
Lenox Head NSW 2478

Prepared by

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1.0 Introduction

Mosquito Consulting Services Pty Ltd was engaged to prepare this Mosquito Impact Assessment for this proposed development. This report will form part of the application for approval of the Master Plan for the site.

Preliminary site investigation was undertaken in October 2002 with more detailed work completed in May 2003.

1.1 Regulatory Context of the Mosquito Impact Assessment

Ballina Shire Council addresses the potential risk of mosquito related impacts of development by adopting a Development Control Plan. The Development Control Plan currently in effect has been developed from The Tweed Council's Development Control Plan No. 25 – "Biting Midge and Mosquito Control in Tweed". Ballina Shire Council is currently developing a new plan. At the time of reporting, the Draft Development Control Plan No. 11 – Mosquito Management had not been finalised or approved by Council. Notwithstanding that, this report takes the draft plan into account in considering mosquito risks for this site.

1.2 Design Philosophy

The design philosophy relative to mosquito management is to demonstrate consistency with Councils Development Control Plan for mosquito management and optimise the amenity of the development for residents and neighbours. Mosquito related risks will be characterised in terms of likely exposure people may experience within the development. Mosquito populations fluctuate in their seasonal abundance. When considering this, the report aims to characterise likely exposure of people within the development over a 90 percentile duration. From time to time, climatic conditions may increase mosquito abundance to unusually high levels. At such times increased exposure to mosquitoes may be experienced.

Controls for mosquito risk management are based in Integrated Pest Management. This uses a number of strategies together including physical layout of developments, stormwater management, and active mosquito control, to achieve control of risks. Maximum use of passive control and minimum use of active mosquito control has been adopted for risk minimisation within this report.

2.0 Investigation Methodology

The mosquito impact assessment identified four main mosquito issues to be investigated. These were investigating actual and potential mosquito breeding on the development site itself; on adjoining lands; assessing likely mosquito management performance of proposed storm water management systems; and assessing likely influences of prevailing winds for mosquito dispersal. Three

mosquito species were considered important to investigate in that context for their recognised role in nuisance biting and disease vectors. These were:

- The salt marsh breeding – *Ochlerotatus vigilax*
- The brackish wetland breeding – *Verrallina funerea*
- The fresh water grassy pool breeding – *Culex annulirostris*

A brief profile of these species is presented in Appendix 1.

It is acknowledged that many other mosquito species may be present in the area, however the above three were considered most important due to their pest and disease potential and the types of available habitat in the general area that may support populations.

Maps and aerial photography of the development site and surrounding areas were obtained from the developer. Additional mapping information on high risk mosquito areas were obtained from Ballina Shire Council's draft Development Control Plan. From the aerial photography, potential habitat was identified for field assessment. Due to the relatively small area of the proposed development, a full inspection was undertaken by walking the site and adjacent areas.

Mosquito breeding was surveyed using standard entomological techniques including dipping of breeding sites for mosquito larvae. No systematic collection of adult mosquitoes was undertaken due to the small size of the site and lack of on-site mosquito breeding. However opportunistic biting collections were made during breeding site inspections on adjacent land.

Weather data was obtained relative to the long term average wind direction and strength to assess likely wind driven dispersal of mosquitoes relative to the site from Ballina's known problem areas.

3.0 Mosquito Production on Site

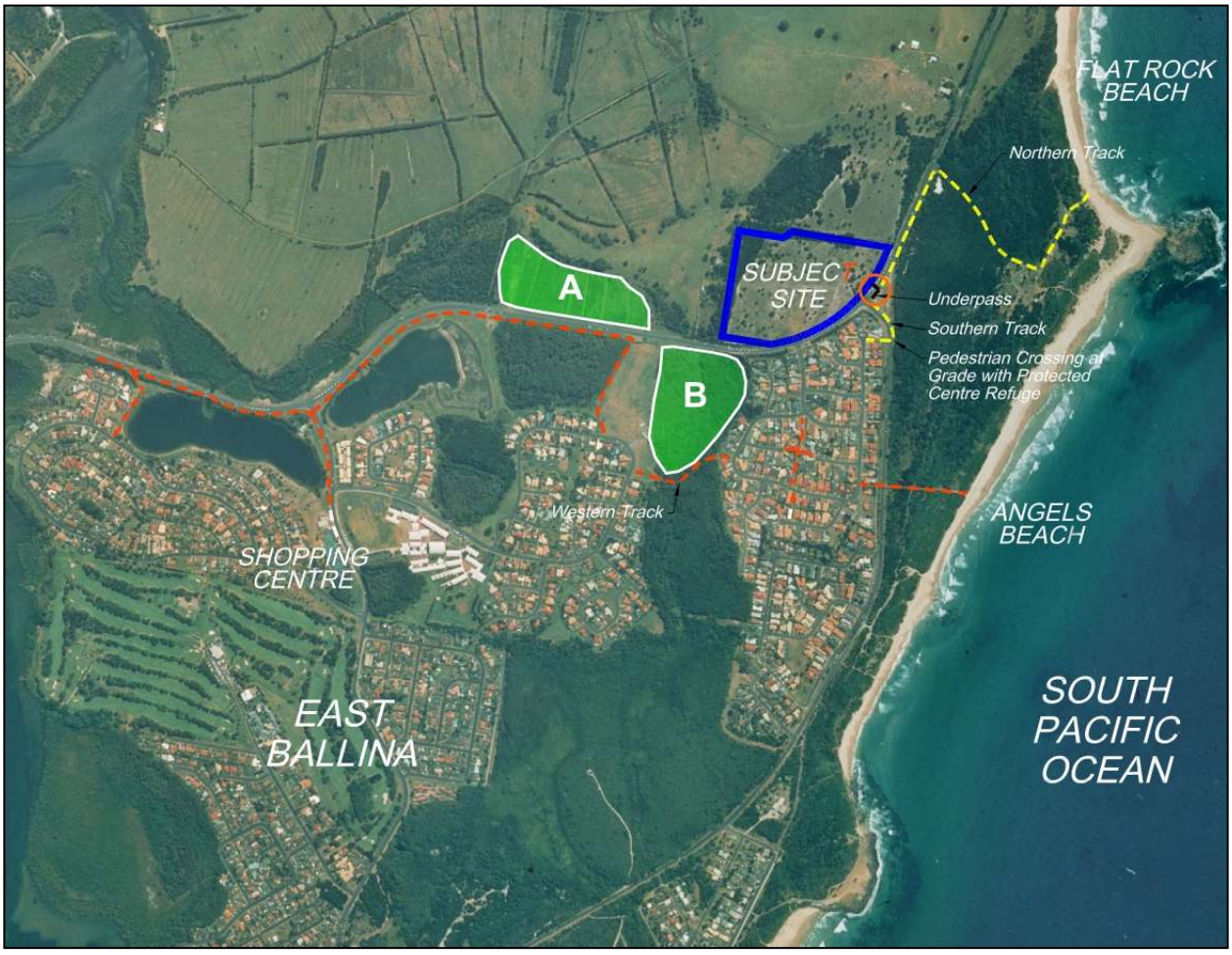
The undeveloped site itself (Lot 208) presents no mosquito breeding habitat. It is well drained with sandy soils absorbing stormwater it catches with minimum apparent runoff. A vegetated corridor if formed along the western and northern boundary by pine trees with a thick understorey. This boundary is elevated forming a ridge steeply sloping down westwards and gently falling to the east. Plates 1 and 2 shows the general character of the site and vegetated boundary.

Plate 1. General view of site

Plate 2-. Vegetated western boundary

4.0 Mosquito Production Off-Site

Plate 3. Near Off-Site Potential Mosquito Breeding Locations: A and B. (Source: Aspect North)



The area on the above map designated “A” is portion of land laying about 250 m west of the development site. It is low lying brackish wetland colonised by sedges and sparse *Melaleuca* trees (Plates 4 and 5.). This area was inspected in October 2002 and in April 2003. In October, no mosquito breeding was found. In April 03 following significant rains, Site “A” was well flushed with storm water runoff and contained only slightly brackish (salinity < 5 parts per thousand) water. In some isolated pools, larvae of *Culex annulirostris* were found. The numbers found however were very low. Overall, Site “A” was found to be producing very few mosquitoes. Observations at the time showed active populations of fish in this wetland. It is considered that the fish present were relatively effective bio-control of mosquitoes at the time of investigation.

Notwithstanding the generally low number of mosquito larvae found in Site “A”, under conditions of lower rainfall the water quality would be expected to become more saline. The form of this habitat is consistent with that used by *Verrallina funerea*. It would be anticipated that from time to time, this site would produce this species of mosquito also. This site was not typical habitat for the salt marsh breeding mosquito, *Ochlerotatus vigilax*.

Plate 4. Site “A”: Eastern end looking north from Angels Beach Road

Plate 5. Site “A”: Western end looking east over brackish wetland

Site “B” is on the southern side of Angles Beach Road and contains wetland portions of mature Melaleuca forest, sedges and reeds. Plate 6 shows a typical view of Site “B”.

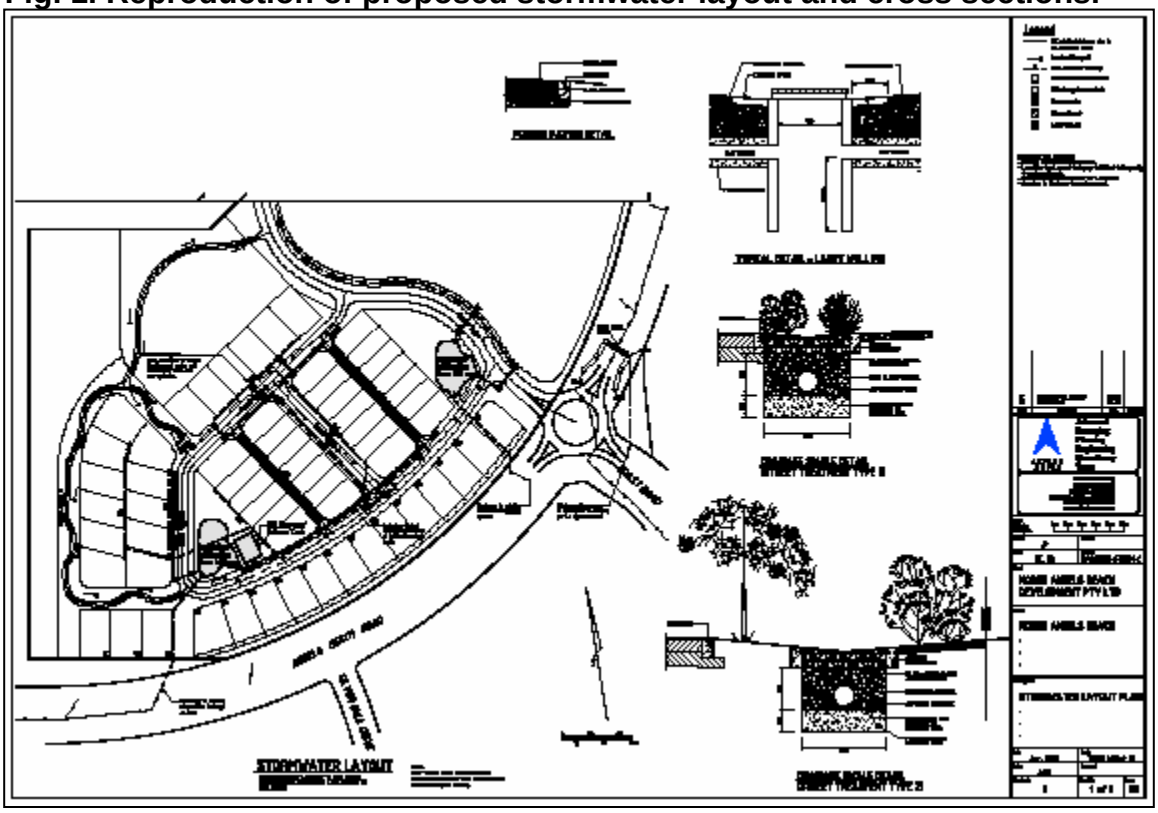
Plate 6. Site “B”: Melaleuca forest and wetland.
View from Angles Beach Road looking south.

At the time of investigation, no mosquito breeding was found within the margins of this potential site. It is considered though that from time to time some mosquito production may occur. The mosquitoes potentially produced within this type of habitat would cover relatively wide range of species. To some extent this could include *Verrallina funerea* and *Culex annulirostris*.

Further pockets of remnant Melaleuca forest exist further west and south of the development site. These were considered to have no direct relevance to the development site due to the distance of several hundred meters involved.

5.0 Proposed Stormwater Management Relative to Mosquito Production

Fig. 1. Reproduction of proposed stormwater layout and cross sections.



From the Engineering Report by ASPECTnorth, Chapter 6 and the Stormwater Layout Plan reproduced above, the stormwater management is proposed to contain the following elements:

1. Infiltration into the sand sub base of flows from road and driveway runoff. This is proposed to be achieved by the use of swales, sand infiltration trenches and leaky pipe and pit systems.
2. Collection of ‘clean’ roof water for further reuse via a centralised collection and reticulation system.
3. Use of porous pavements particularly in areas of high pollutants (eg driveways, laneways etc).
4. Gross pollutant traps and litter traps in pits.
5. Use of open space and buffer areas for retardation and treatment.
6. Bioretention in conjunction with landscaping.

As a general statement, potential mosquito production could be an issue where water is accumulated and stored either in artificial or “natural” systems. Specific areas of the stormwater system that need to be addressed in this report to ensure appropriate controls are in place are:

- Appropriately short retention times for collected surface water prior to it infiltrating into the ground.
- Mosquito proofing of rainwater collection system.
- Minimum retention of water in gross pollutant and litter trap pits.

From the engineering drawing cross sections for the proposed Stormwater Layout Plan, it is considered that minimum mosquito breeding opportunities would be created. However, the retention/infiltration areas should not retain surface water for greater than one week.

Inspection openings and overflow outlets on IAD Storage/Re-use tank should be mosquito proof.

6.0 Proposed development layout (Re Buffer Zones)

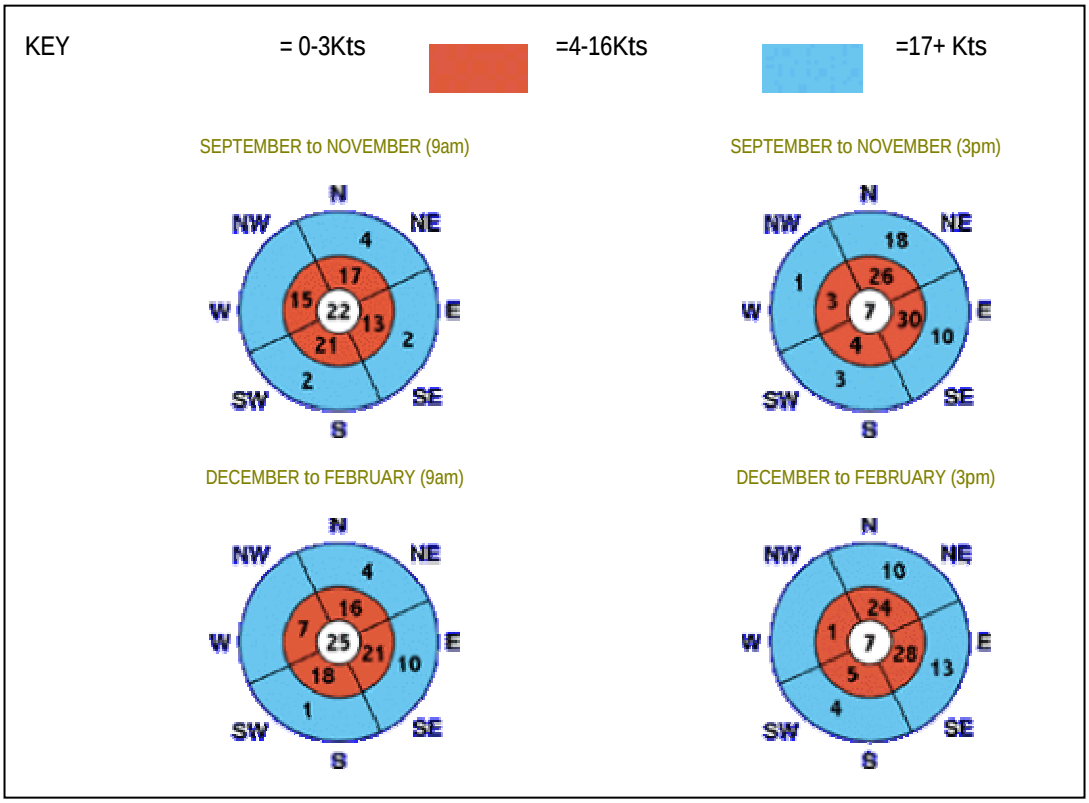
From Figure 1 the proposed alignment of dwelling blocks, roadways and open space are shown also. Open space has been placed within the western and northern margins of the site and have created buffers between the site boundary and dwellings. It is considered that these buffers would reduce migration of mosquitoes identified as potentially produced from the breeding sites “A” and “B” and other further west. The openness of the buffer would promote the effectiveness of easterly sea breezes in reducing mosquito migration into the site. The relevance of sea breezes to this site for mosquito impact is discussed in Part 7 of this report.

7.0 Weather Data (Influence of Wind)

The proposed development site is elevated with ground levels ranging between 25 and 31 meters RL. It is relatively exposed to the east with its nearest point approximately 550 m from the coastline and is subject to coastal winds.

Figure 2 represents long term average seasonal wind direction and strength data produced for Cape Byron. It is relevant to the coast at Ballina East.

Fig. 2. Percentile wind direction and strength at Cape Byron. Long-term data (Modified from Trailer boat Fisherman Magazine and Australian Bureau of Meteorology)



The wind data shows that during the months of higher mosquito activity (September to February) the range of directions has a prevailing easterly component.

In the context of this site, the prevailing wind direction is considered a significant factor in assessing the risk of exposure to mosquitoes from Ballina's known and potential mosquito breeding sites located in a rough arc from the northwest to southwest of the development and including nearby Sites "A" and "B".

8.0 Mosquito Risk Assessment

Mosquito risks for this development were assessed using the Australian and NZ standard for risk management AS/NZS 4360. It gives a framework to consider risk in a disciplined approach that can be repeated in the future to evaluate changes in risk and measure outcomes. The risk management framework follows the basic steps:

- **Identify the Hazard** (Mosquito borne disease, nuisance biting, public complaints)
- **In what Context** (The site's exposure to potential mosquito breeding, the design of the development including stormwater management systems)
- **Identify the Risks** (as a product of hazard and the likelihood of exposure)
- **Prioritise Risks** (What risks are important,)
- **Control the Important Risks**
- **Evaluate control effectiveness.**

8.1 Hazard Characterisation.

The Ballina Shire Council's draft Development Control Plan No. 11 for Mosquito Management, maps high risk areas for mosquitoes. This takes in virtually the whole of the coastal plan including all of Ballina's coastal communities. The potential hazards identified and implied by the Development Control Plan include management of mosquito-borne disease and maintaining exposure of people to biting activity to acceptable levels.

Potential mosquito breeding does exist within relevant distance from the development site. The closest breeding sites identified in this report are Sites "A" and "B". Salt marsh sites for *Ochlerotatus vigilax* also exist within this insect's known flight range.

Therefore the identified hazards are:

- Mosquito-borne disease
- Loss of amenity from mosquito biting activity
- Complaints to Local Government

8.2 The context of the site relative to the hazards

The context of the site relative to mosquito hazards includes:

- There is separation between the potential mosquito breeding site "A" of around 250 meters.
- The mosquito species of interest most likely to be produced in Site "A" is *Verrallina funerea*. This species is considered to have a relatively short pest flight range.
- There appears to be active bio-control of mosquitoes within Site "A" by fish that is limiting mosquito production.
- Site "B" appears to be a potential mosquito site on an intermittent basis.
- The habitat is not likely to produce significant numbers of mosquitoes of interest.
- There is separation between Site "B" and the development by the Angels Beach Road.

- The development site is elevated above the adjacent wetlands and is around half a kilometre from the coastline and is exposed to prevailing easterly winds.
- The development is proposed to have open space located between dwellings and its western and northern boundaries forming buffer zones.
- Stormwater systems maximise the use of infiltration into the site's sandy soils and effectively minimise surface water accumulation and runoff.

8.3 Risk Assessment

The site is within Ballina Shire Council's Draft DCP No. 11, Fig. 4 map for high risk. However, it is considered that the context of this site significantly reduces the risk of exposure to mosquitoes to unacceptable levels. The justification of this assessment is based on:

- Physical separation from potential mosquito breeding sites.
- Additional separation by including open space within the development.
- Significant positive assistance to the site by prevailing easterly winds generally dispersing mosquitoes away from the site.
- Stormwater management systems that minimise opportunity for mosquito breeding within the development.

It is considered that under most conditions this site would have a low risk to people being unacceptably exposed to mosquitoes. Under some conditions such as prolonged wet weather and flooding creating more extensive mosquito breeding opportunities in the region or weather events causing westerly prevailing winds over the warmer months, some level of unacceptable mosquito activity may be experienced generally and within this site.

It is not feasible to accurately characterise the probability of acceptable or unacceptable mosquito exposure. This is due to the subjective and varied nature of people's responses to mosquitoes. However, it is considered that acceptable conditions (for a reasonable person) within the development site would be present greater than 95% of the time during normal seasonal conditions.

8.4 Risk Prioritisation and Control

In the context of the intrinsic site characteristics and proposed development design there are no specific risks that are identified as priority issues to be addressed. Potential risks associated with stormwater management have been adequately addressed within the Engineering Report and associated drawings. The proviso on this is stormwater management design should achieve:

- Appropriately short retention times for collected surface water prior to it infiltrating into the ground. (Surface water should not be retained for greater than one week)

- Mosquito proofing of rainwater collection system.
- Minimum retention of water in gross pollutant and litter trap pits.

7.0 Conclusions

This report concludes that the proposed development would be exposed to low risk of excessive mosquito biting to residents. This is due to a combination of intrinsic and designed characteristics including:

- The site's elevated position and exposure to easterly prevailing breezes.
- Existing separation of mosquito breeding from the site boundaries and by using open space within the development creating a buffer to mosquito activity.
- Appropriate stormwater management system.

It is considered that the exposure of people within the development to mosquitoes would be within generally accepted levels. The report has identified additional design goals for the stormwater management system to ensure mosquito production on-site does not become an issue.

Within the qualifications of this report, Mosquito Consulting Services Pty Ltd is pleased to endorse the proposed development and has assessed it as low impact for exposure to mosquitoes.

Darryl McGinn
Mosquito Consulting Services Pty Ltd.
June 2003

Appendix 1

Notes on General Biology and Ecology of Important Mosquitoes.
(Modified from Muller, M. 2000)

Ochlerotatus vigilax:

This species breeds in brackish and salt marshes and swamps. It is the major pest mosquito of coastal Australia, and occurs in some inland areas where salinity is a problem, such as in the Murrumbidgee Irrigation Area. It is remarkable for its ability to disperse over many kilometres and can reach pest numbers in suburbs well away from the breeding sites.

It will feed readily on people and a broad range of hosts. It is the most important carrier of Ross River virus in Australia and can also carry dog heartworm.

Oc vigilax is the primary target of the majority of mosquito control operations conducted in Eastern, Northern and Western Australia. In southeastern Queensland Local Government spends around $ 10 M p.a. to control this species.

Verrallina funerea:

This species breeds in coastal swamps that are often brackish as they are usually near tidal areas. There is frequently an association with *Melaleuca* sp (paperbark) swamps. Any host that disturbs this species resting in the vegetation around breeding sites will be attacked fiercely. It does not usually disperse far from its breeding areas but if a suitable harbourage corridor exists it may travel up to a kilometre or so. Ross River virus has been isolated from this species in Brisbane.

Culex annulirostris:

This is probably the most common and widespread mosquito across Australia. It is a medium sized brown mosquito with a pale ring around the proboscis. It is most commonly found in freshwater wetland. Its numbers can increase rapidly to pest status after flooding rains, when it will breed in temporary grassy pools such as roadside. It is an important vector for several viruses including Ross River and Barmah Forest.