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PRELIMINARY CONTAMINATED SITE INVESTIGATION

Submission to Ballina Shire Council

ballina shire council

Proposed subdivision of
Cumbalum Views

For:
Intrapac

October 2016

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1 Executive Summary

Ardill Payne and Partners (APP) was commissioned to prepare a Preliminary Contaminated Site Investigation for the proposed subdivision of the lands identified within Cumbalum Urban Release Area Precinct A known as Cumbalum Views. The site is located on the northern boundary of the current Ballina Heights Estate development.

A Preliminary Contaminated Site Investigation was prepared for the abovementioned property in January 2008 and a supplementary Preliminary Contaminated Site Investigation following a revision of the 2008 report in December 2009.

The site history has shown that the land has historically been used for cattle grazing with selective application of herbicides for weed control. The site history did not record any cropping activities from 1935 onwards. The site history extends back continuously for 70 years via the current and previous landowners and aerial photographs. Both sources preclude the use of small cropping such as sugar cane and bananas on the site.

It is understood that previous guidelines have advised that where a complete site history clearly demonstrates that site activities have been non-contaminating, there may be no need for further investigation or site sampling. The guidelines have previously advised that a 50 year uninterrupted site history is sufficient to establish the presence or otherwise of contaminating activities.

Irrespective of this an assessment was made in the Preliminary Investigation for the presence of herbicides and pesticides associated with small cropping practice. The analysis showed that the chemicals used in these agricultural activities are unlikely to have persisted in the soil and are therefore not considered a risk of harm to the proposed land use and therefore not to be Areas of Environmental Concern.

Six Areas of Environmental Concern (AEC) were identified in the 2009 investigation, including fuel storage tanks, dip sites and spray dip, waste disposal pit and fuel storage sheds. Localised contamination may exist around the AECs but no investigation is proposed due to the presence of natural drainage lines, topography buffers, proposed demolitions and removal of hazardous materials and in the case of dip sites the distances from the proposed urban residential development.

Following a review of APP's report, Revision No. 4, Council has requested additional sampling investigations be undertaken based on the heritage consultant's advice that terracing of a portion of the Sheather farm indicates cropping. Council also advises that the Sheather verbal report suggests that prior to Sheathers owning the land cropping may have occurred on the farm.

APP has reviewed this request and advises as follows:

Albert Sheather has completed two site history statements, one in 2005 (for the Sheather property but includes information on the Cumbalum Ridge as a whole) and one in 2008 (for the Vixsun property).

The 2005 Sheather Site History Statement (as included in Attachment 2 of this report) states that:

- Circa 1935: dairy farming on whole of Cumbalum Ridge
- Circa pre 1930's: viable land (of Cumbalum Ridge) used for vegetable growing utilising draught horses
- No horticultural cropping is known to have occurred.

The 2008 Site History Statement (also included in Attachment 2) states that:

- The land was overgrown at the time of purchase (1946) indicating it had not been used for grazing or other agricultural uses for many years
- Early 1900s the land was farmed for cropping purposes.

It is believed that the use of the word 'cropping' in the 2008 statement was incorrectly interpreted as Mr Sheather's 2005 statement specifically states that "no horticulture cropping known" on the subject site.

Aerial photos dating back to 1947 corroborate the Sheather history from that time forward. Based on this advice and the nature of the site in question (the site is steep and it is highly unlikely that any agricultural pursuits would have been undertaken on this site – especially with draught horses), it is highly unlikely that cropping, of a commercial nature or as proposed by the heritage consultant, occurred on this site. It is possible that the rock 'walls' on site were constructed for site stabilisation or non-agricultural gardens.

Regardless of the possible use of the specific site, APP investigated the likely impacts of pesticides and herbicides from that time being used. The investigation (provided hereafter in Sections 5 and 6) found that the likelihood of finding remnants of possible contaminants used in that time was now so remote as for them to be not considered potential contaminants of concern. The soil in place in the early 1900s has most likely been washed away, taking

any possible contaminants. The half-lives of the possible contaminants used in that time would also indicate that remnants would be negligible.

The original report further stated that based on the site history only two potentially contaminating activities were identified; herbicide use in association with pasture management and pesticide use to control ticks and flies on cattle. The original report advised that the likelihood for widespread contamination is considered unlikely, based on the historical land use.

2 Scope of Works

The preliminary investigation undertaken in 2009 involved the undertaking of a Desktop Site History Review and undertaking a preliminary sampling assessment for the site in accordance with Stage 1 of the *Managing Land Contamination: Guidelines* (NSW DOP & DECC, 2008).

Preparation of the Preliminary Site Contamination Investigation Report involved the following:

- Review of available information held by relevant state local authorities, as well as past and present land holders, including the following:
  - historical records such as aerial photography, maps or Council documents;
  - interviews with persons with knowledge of the site and surrounding land use history and site ownership;
  - relevant EPA searches related to the Contaminated Land Record and Protection of the Environment (POEO) License searches;
- Review of the site history and identify AEC and Potential Contaminants of Concern (PCoC) resulting from historical land uses of the site or surrounding properties;
- Compile the findings of the site history review, make a preliminary assessment as to whether the potential for contamination exists; and
- Make recommendations for further investigations if required.

The 2009 investigation was carried out in accordance with the following guidelines:

- SEPP 55 *Remediation of Land* (NSW Dept. Planning, 1998);
- NSW EPA's *Guidelines for Consultants Reporting on Contaminated Sites* (NSW EPA, 1997);
- Northern Rivers Regional Council's Regional Policy for the Management of Contaminated Land (NRRCRP, 2007);
- Ballina Shire Council *Management of Contaminated Land* policy Adopted 28th August 2008.

The *Guidelines for Consultants Reporting on Contaminated Sites* was reprinted with updated agency details and references in August 2011. Ballina Shire Council's *Management of Contaminated Land* policy was revised and adopted on 26th July 2012.

The investigation conducted in 2009 is considered to be in accordance with the revised documents.

3 Site Identification

The lands are located approximately 5km to the north-west of the Ballina CBD. The southern boundary of the land adjoins the existing Ballina Heights Estate development. The lands are generally bounded by the Pacific Highway to the west, the Ballina Nature Reserve to the east and low intensity agricultural (cattle grazing) land to the north.

The parcels of land under investigation were previously described in APP's Preliminary Site Investigation prepared in 2009. However due to amalgamation and subdivision of some of the existing lots, some land identification numbers have changed. The latest land identification numbers are included in Table 1 below.

Table 1: Lands Subject to Proposed Subdivision

Owner	Lands – description	Existing Zoning
Intrapac (formerly Vixsun Pty. Ltd.)	Lot 32 DP 1223594 (formerly Lot 418 DP 1215902)	RU1 – Primary Production R3 – Medium Density Residential
Joy Iris Sheather	Lot 31 DP 1223594 (formerly Lot 2 DP 1171927) Lot 2 DP 1213872 Lot 30 DP 1223594 (formerly Lot 18 DP 1022777)	RU1 – Primary Production RU2 – Rural Landscape R3 – Medium Density Residential
Intrapac	Lot 20 DP 1022777	RU1 – Primary Production RU2 – Rural Landscape R2 – Low Density Residential R3 – Medium Density Residential
Margaret Elizabeth Smith, Jennifer May Barlow & Robynne Muriel Barlow	Lot 3 DP 517149 Lot 2 DP 823662 Lot 3 DP 823662 Lot 150 DP 755684 Lot 333 DP 755684	RU1 – Primary Production R2 – Low Density Residential R3 – Medium Density Residential

The existing lots and proposed lot layout are shown on Figure 1 in Attachment 1.

4 Site History

The following site history information is a collation of the following:

- Aerial photographs;
- EPA searches related to the Contaminated Land Record and Protection of the Environment Operations (POEO) License;
- Department of Primary Industries Cattle Tick Dip search; and
- Follow up interviews with previous and current site owners.

4.1 Review of Aerial Photographs

A review was undertaken of available historical aerial photographs from the period 1958 – 1994 to confirm the land uses as indicated by former or current land owners.

1958 (NSW Department of Lands, Run 6 October 1958, 1:55000)

The entire site appears to be used for low intensity agriculture (cattle grazing) with some rural residential dwellings and sheds distributed along the eastern side of the Pacific Highway. The scale of this image does not allow for many features to be identified, however there is no evidence of agricultural cropping anywhere on the site.

1967 (NSW Department of Lands, Run 8 21/05/1967, 1:55000)

The land use does not appear to have changed since the last image. The Department of Lands has enlarged the land parcels under investigation, thus improving the scale of the image. The darker shaded areas indicate more moisture or wetter areas, particularly on the lower areas of Lot 20 and 21 DP 1022777, Lot 3 DP 517149, Lot 31 DP 1223594 and Lot 390 DP 1199596.

There are few structures visible on the land parcels under investigation and residential dwellings tend to be adjacent to the Pacific Highway which is outside of the area of investigation.

A long thin shed is visible on Lot 333 DP 755684 along the eastern boundary. This could be a dairy bale or milking shed. Another similar looking structure appears to be located Lot 20 DP 1022777 which runs in an east-west direction. Several long, thin sheds which could be dairy bales are evident south of the south-western corner of the site on the current Ballina Heights Estate site.

1979 (NSW Department of Lands, Run 5 03/04/1979, 1:41000)

The land use across the site does not appear to have changed since the last image. The long thin shed running east-west direction on Lot 20 DP 1022777 as noted in the previous image appears to have been replaced with another shed running north-south. A similar sized structure is noted to the south-west of the subject site.

There are several rows of trees which run in straight lined, which appear to coincide with lot boundaries on the site. A structure on the western side of Sandy Flat Road has appeared on Lot 333 DP 755684.

Sugar cane crops have appeared on the property directly north of Lot 150 DP 755684. This land comprises the north eastern section of the subject site. Refer Figure 3 below.

1987 (NSW Department of Lands, Run 5 01/08/1987, 1:40000)

No change in the land use is evident on this image. A structure with a north-south orientation is evident along Sandy Flat Road on Lot 333 DP 755684. Refer Figure 4 below.

The residential estate along Summerhill Crescent has been constructed and some dwellings are apparent. The Ballina Airport can be seen to the west of this estate. A macadamia plantation has appeared west of the subject site, on the western side of Emigrant Creek.

1994 (NSW Department of Lands, Run 9 24/07/1994, 1:25000)

No change in the land use is apparent on this image. The only evident change is the appearance of the following:

- A dam has emerged on Lot 20 DP 1022777

2009 (Google Earth)

No change in the land use is apparent on this image, however some minor changes to the site features are summarized as follows:

- Two residential sized structures are visible on Lot 333 DP 75684

Current Web based imagery on Google Earth from 16/04/2015

No change in the land use is apparent in this image, however some minor changes to the site features are summarized as follows:

- A reservoir (to service the proposed development) is visible on Lot 31 DP 1223594 (formerly Lot 1 DP 1171927 and previously identified as Lot 79 and 85 DP 755684).
- A small shed like structure is visible on the southwestern portion of Lot 333 DP 755684

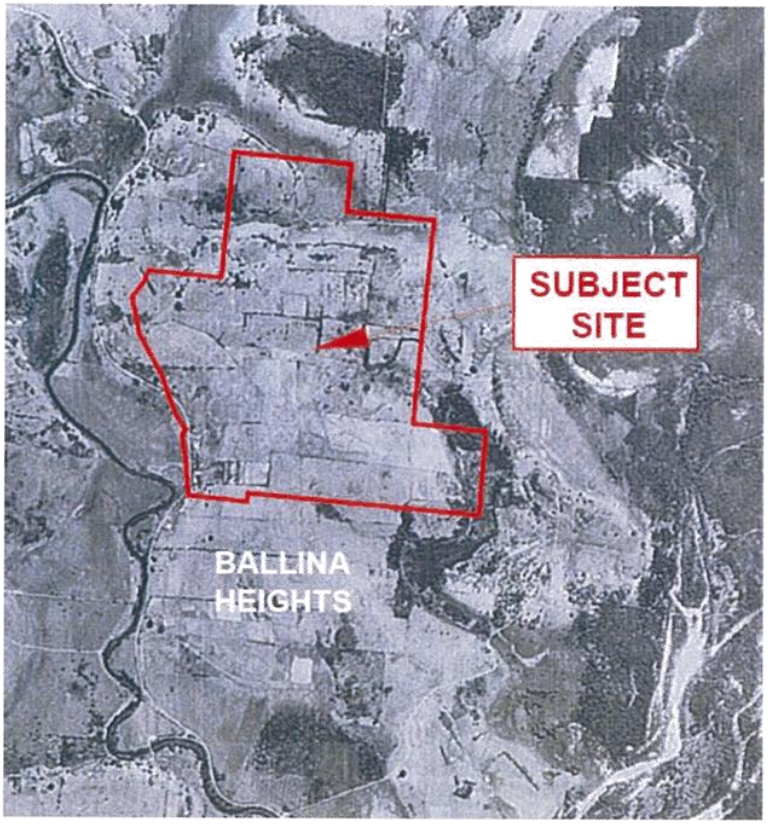


Figure 1: Historical Aerial 1958 with Indicative Site Boundary

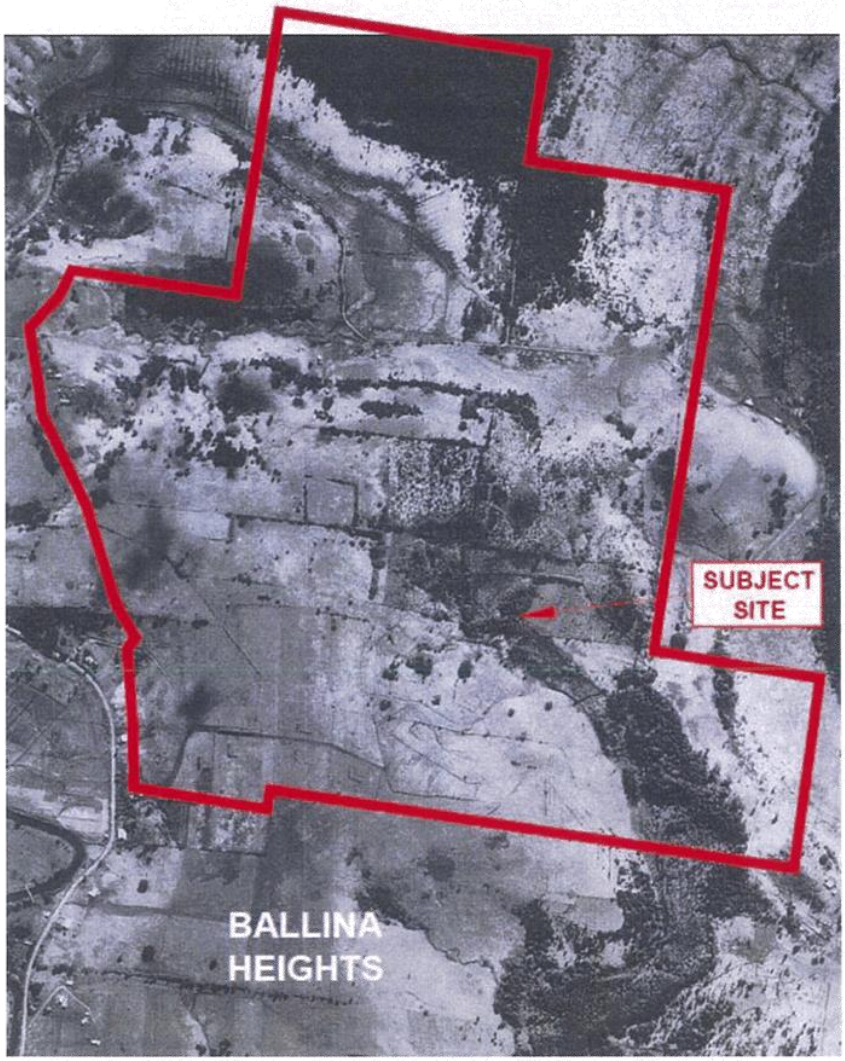


Figure 2: Historical Aerial 1967 with Indicative Site Boundary

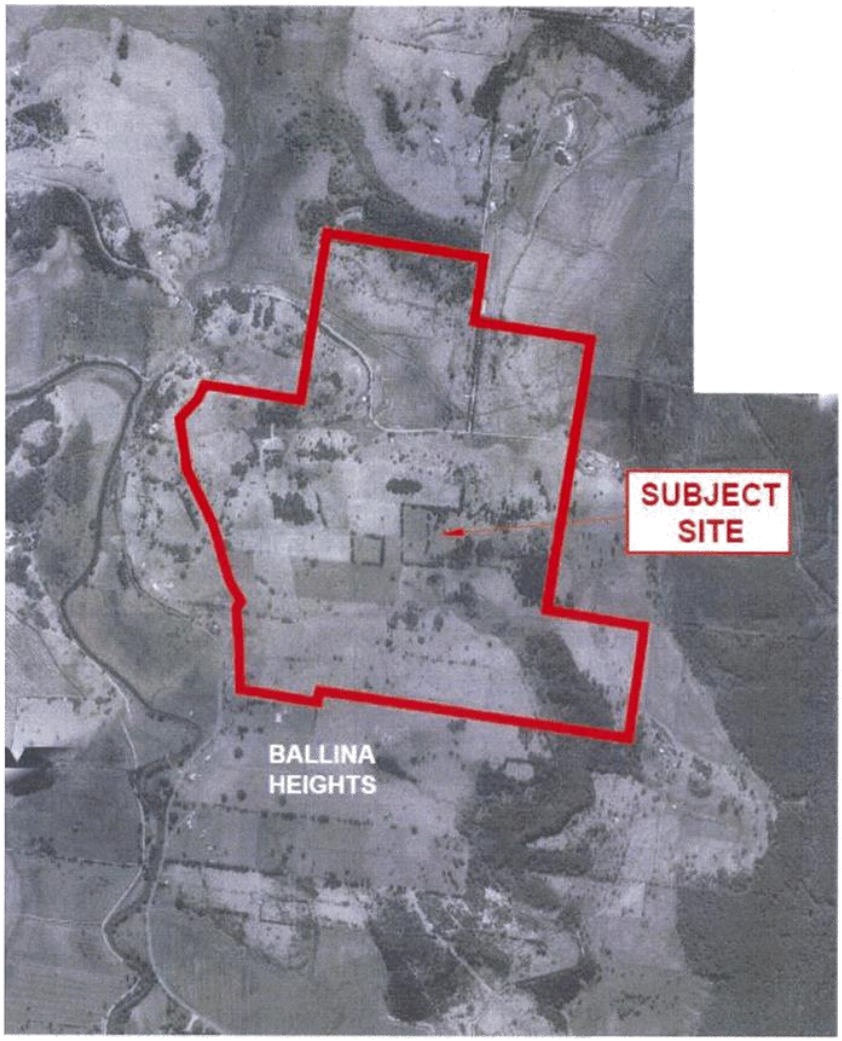


Figure 3: Historical Aerial 1979 with Indicative Site Boundary

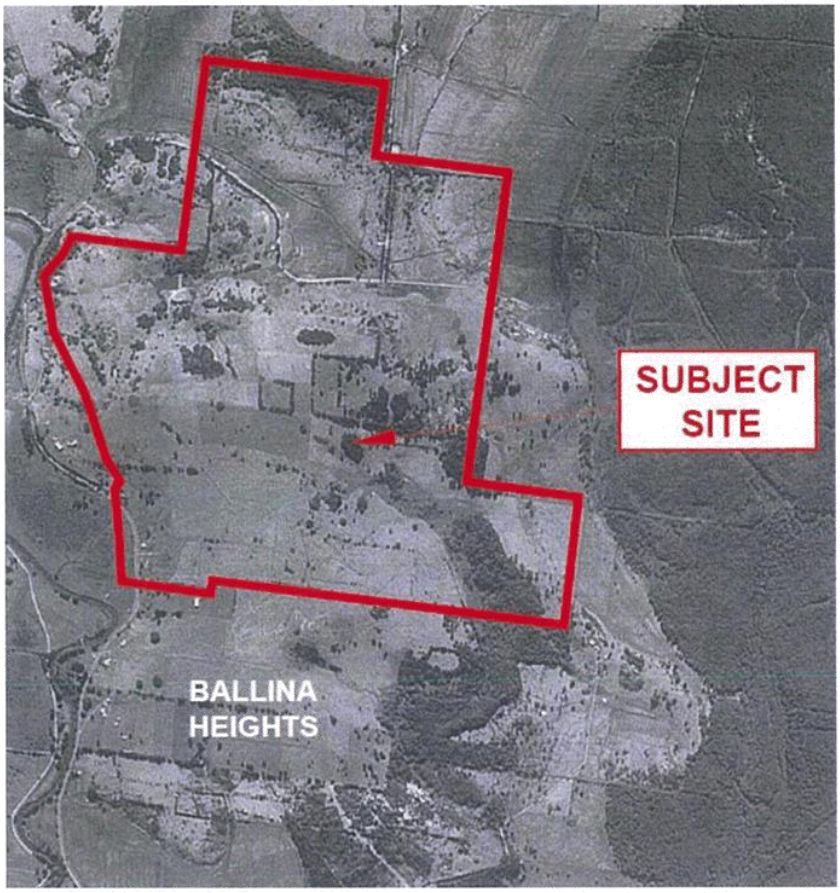


Figure 4: Historical Aerial 1987 with Indicative Site Boundary

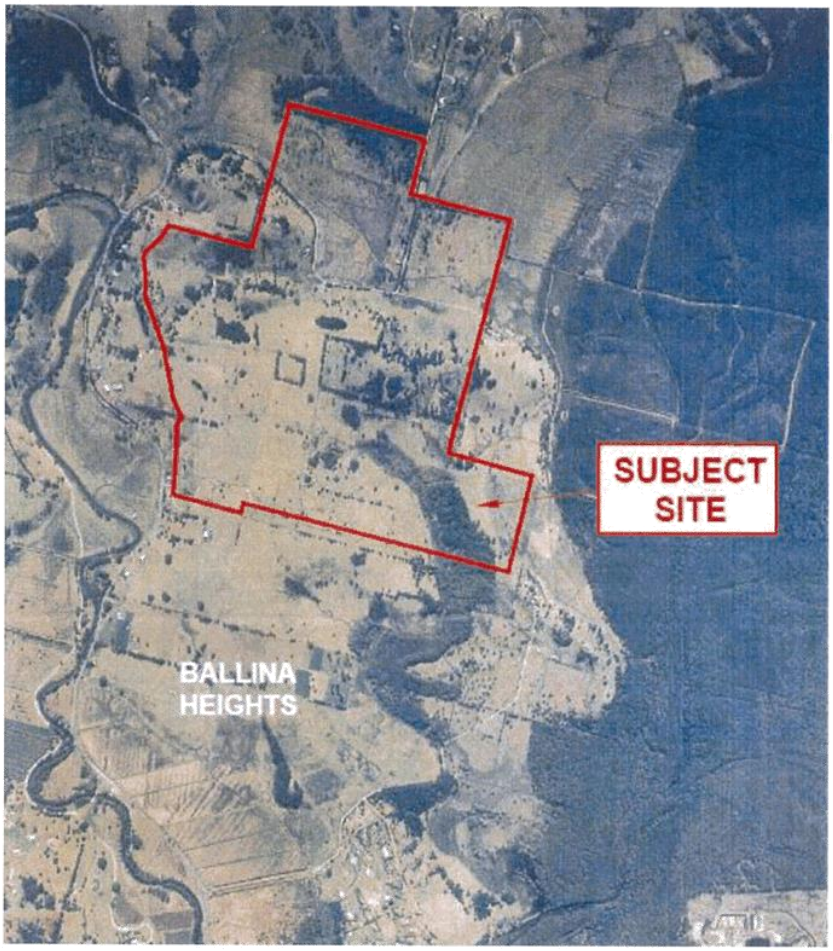


Figure 5: Historical Aerial 1994 with Indicative Site Boundary

Figure 6: Historical Aerial 2009 with Indicative Site Boundary

Figure 7: Historical Aerial 2015 with Indicative Site Boundary

4.2 NSW Department of Primary Industries Cattle Tick Dip Search

A search of the NSW Department of Primary Industries Cattle Dip Site Locator was initially undertaken on 17th June 2009 and indicated that there were two cattle tick dip sites located within the town/locality of Cumbalum. However, there are actually four cattle tick dips located within the Cumbalum area. An additional search was undertaken on 10th November 2015 to confirm these findings. Details of the dip sites are provided in Table 2.

Table 2: Cattle Tick Dip Sites within the Cumbalum Area

Dip Name	Road	Approximate Distance (m) and Direction from Site	Status	Chemicals	
Laurel	Pacific Highway	0.45 Km to the South-West	Lease Active, Decommissioned & Capped	Arsenic	7/54
				DDT	1/61
				Dioxathion	10/62
				Dioxathion Ethion	5/73
				Dioxathion Ethion Chlordimeform	11/73
				Ethion Chlordimeform	5/74
				Promacyl	10/85
				Amitraz	11/86
Cumbalum	Inghams Road	1.66 Km to the South-West	Lease Lapsed & Decommissioned & Capped	Arsenic	3/43
				Arsenic	7/48
				DDT	12/60
				Dioxathion	10/62
				Dioxathion Chlordimeform	11/73
				Dioxathion Ethion Chlordimeform	9/74
				Cypermethrin Chlorfenvinphos	2/86
Sandy Flat	Sandy Flat Road	On Lot 333 DP 755684	Lease Lapsed & Decommissioned & Capped	Arsenic	8/52
				DDT	12/60
				Dioxathion	10/62
				Dioxathion Ethion	10/72
				Ethion Chlordimeform	10/73
				Cypermethrin Chlorfenvinphos	5/84
				Flumethrin	9/90
Tambos	North Teven Road	2.5 Km to the South-West		Arsenic	7/54
				Dioxathion	10/62

Dip Name	Road	Approximate Distance (m) and Direction from Site	Status	Chemicals	
			Lease Lapsed & Decommissioned & Capped	DDT	1/66
				Dioxathion Chlordimeform	10/73
				Cypermethrin Chlorfenvinphos	12/83

NOTE:
Decommissioned – means all the standing structures (shed, fencing and roof) of the dip bath have been dismantled, and the bath itself, is emptied of all chemical fluid and is capped with concrete lids. The bath may have been demolished prior to decommissioning in which case it is usually smashed and buried. Clean soil may be spread around the bath to run flush with the bath edge and then grassed. The draining pen concrete floor is usually left intact so as not to disturb the surrounding soil.
Lapsed – which means the dip is still standing, capable of dipping operations either immediately or with some minor refurbishment.

The long thin structure seen in the 1967 aerial photo on Lot 333 DP 755684 west of Sandy Flat Road is potentially the holding or draining pens for the dipsite. DPI records indicate this dip operated as far back as 1952 and the location of this structure on the aerial, corresponds to the coordinates provided by the DPI.

The Cattle Tick Dip Site Management Committee (DIPMAC) recommend further investigation if developments are within 200m of a dip site. The Sandy Flat Road dip site is located on one of the subject land parcels (Lot 333 DP 755684). As part of the rezoning proposal, the land north of Sandy Flat Road is considered flood liable and unsuitable for urban residential development. Thus it is not proposed to conduct any further investigation on this portion of the site.

Land south of Sandy Flat Road is proposed for future residential development. Taking this into consideration, the land south of Sandy Flat Road is over 200m south of this dip site and thus out of the zone where further investigation is required. A sports field site is proposed on the eastern portion of Lot 150 DP 755684. The proposed site is greater than 200m east of the Sandy Flat dip. Thus it is not proposed to conduct any further investigation of this dip site unless the proposed land use changes in the future.

None of the properties under investigation for the Cumbalum Views development encroach within the 200m buffer zone of the Laurel dip site. Therefore, no investigation of the site with regard to potential contamination associated with the dip site has been conducted.

The DPI was contacted during the 2009 investigation to confirm the location of the spray dip site that Mr Albert Sheather (former land owner) indicated was operated on land now owned by the Roads and Maritime Services (RMS) which is located south-west of Lot 30 DP 1223594 (formerly Lot 18 DP 1022777). George Nastase of the DPI advised that their records indicated the spray dip was referred to as 'Quinlans spray' however they did not have any further information relating to its specific location. Spray dips are typically privately built and maintained and were introduced after the cessation of persistent chemicals such as Arsenic or DDT. Any one of the small shed like structures south-west of Lot 30 DP 1223594 (formerly Lot 18 DP 1022777), observed in the 1967 aerial image, might be the privately owned Quinlans Spray dip location.

Mr Mick Sheather (son of Albert Sheather) was contacted on 22nd July 2009 to confirm the location of the Quinlan dip site. He advised the following:

- The dip site was located on the flat area which is now the north bound lane of the Pacific Highway;
- The dip was an above ground structure where cattle were directed down a corrugated iron tunnel and sprayed with a fine mist of pesticides, similar to a car wash facility; and
- The dip was operated between the 1970's to mid-1980s.

The DIPMAC guidelines suggest that persistent chemicals arsenic and DDT were used in dip baths up until 1962. Mr Nastase of the DPI was contacted again on 22nd July 2009 regarding the possible chemicals used in the spray dip between the early 1970's and mid 1980's. He suggested the following three chemicals may have been used: Bayticol (Flumethrin), Barricade S (chlorfenvinphos cypermethrin) and Promacyl (Promicide). These chemicals have been assessed further in Section 5.

The former spray dip site is less than 200m downslope of the closest southwesterly corner of Lot 30 DP 1223594 (formerly Lot 18 DP 1022777) but is greater than 200m from the closest proposed residential property, as shown on Figure 3 (Attachment 1). Therefore, no investigation of the site with regard to potential contamination associated with the dip site has been conducted

The 200m buffer established in DIPMAC guidelines is for plunge bath structures as opposed to a site where cattle were enclosed in crushes and dosed with minor quantities of ectoparasite treatments using hand held spray units. Therefore, it is unlikely that such application methods would have caused contamination to the extent of a dip bath and the 200m buffer is not considered to be applicable to this site.

Steep terrain exists between the Quinlan Spray site and Lot 30 DP 1223594 (formerly Lot 18 DP 1022777). Given the steep terrain, it is unlikely that cattle treated at this dip site would have traversed up this hill onto Lot 30 DP 1223594. The likelihood for residual contamination to have resulted from the Quinlan spray site on the subject site is considered nil, thus it is not proposed to investigate this area further.

4.3 NSW EPA Contaminated Lands Record Search

A search of the NSW EPA Contaminated Land Record (CLR) was conducted in 17th June 2009 to search for notices issued by the NSW EPA on sites that were contaminated and required further investigation or remediation. The search showed two notices were issued within the Ballina Shire Council area in Lennox Head and Macleans Ridges. An additional search was undertaken on 10th November 2015 to confirm these findings. An additional notice was recorded within the Ballina Shire Council area in West Ballina.

All three of the above listed sites on the DECC contaminated sites register are considered too far to cause impact to the subject site and have been eliminated from further investigation.

4.4 Protection of the Environment Operations (POEO) Act Licenses

The DECC maintains a register of Environmental Protection Licenses (EPL), Environment Protection Notice (EPN) and/or Noise Control Notices (NCN) and Convictions in Prosecutions under the POEO Act, which are discussed below:

- An EPL is issued to operators conducting commercial/industrial activities that have the potential to cause environmental impact. The license specifies terms by which the operator must adhere in order to conduct their operation in an environmentally safe manner and prevent pollution; and
- An NCN or EPN is issued if the commercial/industrial activity is in breach of its EPL, and prosecution is pursued when the operator has not rectified the activity for which an EPN/NCN is issued.

A search of licensed activities as per Schedule 1 of the Protection of the Environment Operations Act 1997 was conducted on 17th June 2009, which revealed 24 licenses or notices (issued or surrendered) and 17 notices issued within the Shire of Ballina. The closest identified licensed operations to the site were:

- License: 2261, Licensee: Boral Resources (Country) Pty Ltd, at North Teven Road, Teven. Located 2.57 km to the west of site;

- License: 12710, Licensee: Gradex Civil Contractors Pty Ltd, at Newrybar Swamp Road. Located 2.87 km to the north-east of site; and
- License: 12910, Licensee: Leighton Contractors Pty Ltd, Pacific Highway Alignment Ballina. Located over 2.24 km to the north-east of the site.

An additional search the current list was undertaken on 10th November 2015, which revealed 13 licenses (issued, surrendered, pending or no longer in force) and one compliance audit within the Shire of Ballina. The closest identified licensed operations to the site were:

- License: 12910, Licensee: Leighton Contractors Pty Ltd, Pacific Highway Alignment Ballina, Status: issued
- License: 12642, Licensee: Roads & Traffic Authority of New South Wales, Pacific Highway Alignment – Emigrant Creek site, Status: surrendered, Received: 02/06/2008

All of the above operations are considered too far from the subject site to have caused contamination to the subject site and have been eliminated from further investigation.

5 Areas of Environmental Concern

Seven Areas of Environmental Concern (AEC) were identified in the 2008 investigation, prepared by APP. AEC's are considered a possible source of Potential Contaminants of Concern (PCoC). For this investigation, four AEC have been considered, which are shown on Figure 3 (Attachment 1) and include the following:

- Two 1000L fuel storage tanks: one diesel tank on Lot 30 DP 1223594 (formerly Lot 18 DP 1022777); and a tank on Lot 333 DP 755684. The fuel tank on Lot 30 DP 755684 is outside of the proposed Cumbalum Views development area and is thus eliminated from further consideration from this investigation;
- Fuel stored in a shed on Lot 20 DP 1022777;
- The Sandy Flat Road dip site on Lot 333 DP 755684 is within the proposed Cumbalum Views development area; and
- The waste disposal pit on Lot 85 DP 755684.

The chemicals used for weed control across the site are unlikely to have persisted in the soil for long periods of time and are not considered a significant risk of harm to the proposed land use. Therefore they will not be investigated further.

It was previously thought that bananas may have been cultivated on Lot 21 DP 1022777 (outside of the Precinct A land parcels). The 2009 report found that anecdotal information and aerial photographs did not support the theory. Therefore it will not be investigated further.

The location of the identified AEC in relation to the proposed development plans are shown on Figure 4 (Attachment 1).

5.1 Fuel Storage

Localised contamination from fuel spills or leaks would be present around tanks or storage areas in sheds. Testing within the vicinity of the fuel tanks is not deemed necessary as one tank, while located on Lot 30 DP 1223594 (formerly Lot 18 DP 1022777), it is located off the Cumbalum Views land parcel, and no development is proposed within 100m of the second tank (Lot 20 DP 1022777).

Minor quantities of tractor fuel have historically been stored in the garage of the dwelling located on Lot 390 DP 1199596. This is believed to be for general yard work and not a quantity that warrants an investigation.

The dwelling is to be demolished as part of the Cumbalum Views development. All hazardous materials are to be removed from the site in accordance with the demolition contract for the house. Testing is not deemed necessary as the dwelling is to be demolished and hazardous materials to be disposed of off-site.

5.2 Cattle Dip and Spray Sites

George Nastase of the NSW DPI has advised that the Sandy Flat Road dip was decommissioned in 2002 and ceased operation by 1995 when the lease of the site lapsed. The DPI definition of decommissioning includes removal of the structures (shed, fencing and roof, bath), emptying of chemical fluids and capping with concrete lids. Clean soil may have been spread around the bath and the concrete floor of the draining pen is usually left intact so as not to disturb the surrounding soil. The status of the Quinlan spray site is unknown.

The DIPMAC recommend further investigation if developments are within 200m of a dip site. These guidelines indicate that the extent of contamination surrounding a dip site is approximately 20m uphill or on the flat and 50m downhill of the dip bath. The migration of contamination from a dip site can occur via the following means which are discussed further:

- Erosion or runoff are the most likely means;
- Spray drift; and
- Stormwater runoff or windblown dust.

As stated in Section 4.2, there were no details were available regarding the Quinlan spray site, but from the information obtained to date, it does not appear that a dip bath was operated on this site. Anecdotal information suggested that cattle were enclosed in crushes and dosed with minor quantities of ectoparasite treatments using hand held spray. With the above in mind, it is unlikely that such application methods would have caused contamination to the extent that dip baths have been known to.

It is understood that the Quinlan Spray site is located on land that was acquired by the RMS and is now the site of the Ballina Bypass. Thus it is assumed that this site has been investigated, remediated or demolished by the Ballina Bypass Alliance during construction works along the Pacific Highway.

The proposed location for a stormwater treatment pont and a gravity fed sewer main is within 200m (upslope) of the Quinlans Spray site. It is

impossible for any contamination from the spray site to have impacted the proposed development area, given the terrain separating them. Therefore it is not proposed to conduct any further investigation of the spray site.

Several services (stormwater treatment ponds, water mains, sewer and stormwater trunk lines) are within the 200m of the decommissioned Sandy Flat Road dip site. The NSW Department of Primary Industries Cattle Dip Site Locator site indicates that the dip site was decommissioned and capped. It is not anticipated that soils surrounding the dip site will be disturbed for the installation of services. Residential developments are greater than 200m from the dip site. The land will not be used for such purposes as growing vegetables or raising livestock, thus there is no exposure via these pathways. It is therefore considered that no further investigation of this site is required.

5.3 Waste Disposal Pit

Historically, it has been common for farmers within Australia to bury their wastes within their lands. Such wastes could include empty chemical (fuels, oils or pesticides etc.) drums, masonry, scrap metal (fencing, roofing), tyres, wood products (from fences) etc. The 2008 investigation referred to buried waste pits which contained cow carcasses and roofing iron. There is a possibility that more buried waste pits exist on site, which may not have been used for a number of years. This makes it very difficult for them to be located, and they could be a localized source of contamination. Typically however, they were located in low lying areas of farm sites, where development is generally not proposed.

It is recommended that they will not be investigated further as part of this investigation. But if any possible waste disposal pits are uncovered during works onsite, then further investigations will be conducted.

6 Potential Contaminants of Concern

Two categories of Potential Contaminants of Concern (PCoC) associated with the AEC have been identified and are discussed below. A collation of the chemicals listed by the interviewees in Table 2 of the 2008 Preliminary Investigation Report and Section 4.2 of this report, have been included as Potential Contaminants of Concern (PCoC) for this assessment. They include:

- Chemicals used on site for weed or pest control as provided by the former or current site owners and listed in Table 3 of the 2008 investigation; and
- Chemicals used in the dip sites listed in Table 4 of this current investigation and those recommended by the DPI which may have been used at Quinlan's spray site.

6.1 Herbicide Application for Weed Control

Table 3 investigates the environmental fate and persistence in soil of the chemicals used for weed control on the land parcels under investigation.

Table 3: Herbicide Used for Weed Control Onsite

Herbicide Name	Active Ingredient	Environmental Fate
Asulox[1]	Asulam	Asulam is a carbamatae pesticide, with short persistence in soil. It is biodegradable and will not accumulate in soil.
Amicide 625 Low Selective Herbicide	Triethanolamine and diethanolamine salts, lignosulphonate derivative and water	Rapid degradation in soils with a typical half-life of 7 days. Microbial degradation is the main breakdown pathway.
Bromicide 200 Selective Herbicide	Bromoxynil octanoate and liquid hydrocarbon.	Bromoxynil has low mobility and persistence in soil. It degrades faster within sandy soils, with a half-life of 10 days. Within clay soils the half-life is approximately 2 weeks because it is more persistent.
Frenock[2]	Flupropanate	Flupropanate is immobile in soils and has a slow rate of biodegradation.
Grazon* Extra Herbicide	Triclopyr Butoxyethyl ester, Picloram, Aminopyralid and Balance	Triclopyr is considered readily biodegradable, with a half-life in aerobic soils between 6-52 days. Picloram is not as readily biodegrdaable with a half-life between 167-513 days in aerobic soils, or less than 300 days in anaerobic soils. The persistence and degradation rate of Aminopyralid is unknown.

Herbicide Name	Active Ingredient	Environmental Fate
Roundup	Glyphosate, surfactant and water	Glyphosphates will bind tightly to the soil and has low leaching potential. It is rapidly and completely degraded by microbial action into carbon dioxide, water, nitrogen and phosphate. The average soil half-life is 60 days.
2-4-D	2,4-D dimethylamine, 2,4-D diethanolamine, water	Degrades in soil with a half-life of days to weeks and not very mobile in soil.

NOTE:
1 – The 2008 SEPP 55 investigation referred Auclox being used for bracken control. Asulox is believed to be an equivalent product.
2 – The 2008 SEPP 55 investigation referred to Fernock. It is believed this was meant to be Frenock.

No information could be obtained on Frenock's degradation and environmental fate, however information on alternative products with the same chemical composition (Flupropanate) was obtained.

6.2 Cattle Dip and Spray Sites

Anecdotal information suggests that the Quinalns spray site was operated between the early 1970's and mid 1980's. No information was obtained on the specific chemical usage in this spray tick treatment site. Thus it is assumed that the latter site used similar chemicals employed in surrounding dip sites or those three chemicals suggested by the DPI in Section 4.2.

DDT was used in surrounding dip sites (as indicated in Table 2) between 1960 and 1962 so it is unlikely that this chemical was used at the Quinlan site. Other chemicals used during 1970-1985 at surrounding dip sites, that may have been used at the Quinlan site include: Dioaxthion Ethion Chlordimeform, Dioaxthion Chlordimeform, Dioaxthion Ethion, Ethion Chlordimeform and Cypermethrin Chlorfenvinphos.

Three of the chemicals used in the local dip sites are considered Organphosphorus Pesticides with moderate persistence (Dioxathion, Ethion and Chlorfenvinphos). DDT was used in the Sandy Flat dip site between December 1960 and October 1962. DDT is considered a persistent Organochlorine. Table 4 investigates the environmental fate of the dip site chemicals and likelihood for persistence in the soil.

Table 4: Pesticide Use in Cattle Tick Dip Sites

Pesticide Name	Active Ingredient	Environmental Fate
Barricade S	Chlorfenvinphos (organophorus compound) and Cypermethrin (pyrethroid)	1. Chlorfenvinphos degradation occurs more rapidly in soil with less organic matter such as sands. Degradation rate is dependant on soil temperature and soil half life can range between less than 7 days to 18 weeks. 2. Cypermethrin has a strong tendency to adsorb to soil particles, is not mobile in soil and is unlikely to cause groundwater contamination. The half life ranges between 8 to 29 days depending on the amount of sunlight and soil pH. It degrades more rapidly in soil with lower organic matter.
Bayticol Cattle Dip and Spray	6% Flumethrin and 77% aromatic hydrocarbons	No information related to the environmental fate was provided on the MSDS.
Chlordimeform	Chlordimeform	Chlordimeform and its metabolites have half lives in soil ranging between 20 and 40 days.
Coopers Promicide Dip and Spray	Promacyl	No longer produced. The APVMA license was ceased in 30th June 2001.
DDT	DDT	Over time DDT breaks down into its metabolites DDD and DDE, which have similar chemical and physical properties to DDT. DDT and its metabolites are very persistent, with varying reported half lives ranging from 2 to 15 years and up to 30 years or more. DDT binds strongly to organic matter within soil, is reported to break down faster in warmer climates and in soils with low organic contents. Degradation occurs via volatilization, photolysis (breakdown by light) and biodegradation. Use of DDT was banned in Australian in 1987.
Ethion	Ethion	Ethion binds tightly to soil and undergoes biodegrdation by microorganisms in the soil. The degradation time can range from 1 month to 1 year, depending on the temperature and soil type.

It is noted that no information relating to the environmental fate of Dioxathion could be found. Alternative product names such as *Delnav*, *Deltic, Dioxane* and *Denatax* were also investigated but no information pertaining to the degradation or half-life of these products could be found.

Of the previously listed chemicals, Ethion has the second longest half-life next to DDT, of one year. Since Ethion was used in the surrounding dip sites between 1972 and 1973, it is highly unlikely that this pesticide would persist in the soils. It is also unlikely that other potential pesticides used would have persisted in the soil, given the half-lives presented in Table 4.

Both DDT and arsenic bind strongly to soil with low leaching potential. It is noted that arsenic does not breakdown in the environment, rather it changes into different chemical forms, some of which can be more toxic than the original state.

7 Conclusions and Recommendations

Ardill Payne and Partners (APP) was commissioned to prepare a Preliminary Contaminated Site Investigation for the proposed subdivision of the lands identified within Cumbalum Urban Release Area Precinct A. The site is located on the northern boundary of the current Ballina Heights Estate development.

This site history has shown that the land has historically been used for cattle grazing with selective (spot) application of herbicides for weed control. This has been confirmed by review of aerial photography of the site. The chemicals used for weed control are unlikely to have persisted in the soil for lengthy periods and are not considered a significant risk of harm to the proposed land use.

Diesel fuel tanks, fuel storage sheds and a cattle tick dip site were also identified on the site. Two other dip sites were identified to the south-west and west of site. No contaminated sites or industrial activities operating under and Environmental Protection License were identified within 1 km of the site.

Aerial photos and anecdotal information from former land owners has not supported the suggestion that a banana plantation existed at Lot 21 DP 1022777. Additionally these lands do not form part of the Precinct A land parcels, therefore no further investigation of this area is considered warranted.

Six Areas of Environmental Concern (AEC) were identified in this investigation, including fuel storage tanks and sheds, dip sites and spray dip and the waste disposal pit. Localised contamination may exist around these AECs but testing within the vicinity of the fuel tanks is not necessary as one tank is located off the Precinct A land, no development is proposed within 100m of the second and the site where minor quantities of tractor fuel was stored is to be demolished with hazardous materials being disposed of off-site.

Testing of dip sites, spray sites and waste disposal pits are not proposed due to the fact that all dip/spray sites have been decommissioned and/or capped and no residential developments are proposed within 200m of each site. Services will be installed within between 100 – 200m of the dip site, but the risk to human health is considered minimal, given that most of the contamination associated with the dip site will be within 20m of the bath structures. If any possible waste disposal pits are uncovered during works onsite, then further investigations will be conducted.

Testing of the terraced areas as requested by Council is not proposed due to the fact that the cropping postulated by the heritage consultant is not supported by the history and site conditions. Furthermore, given the likelihood of finding remnants of possible contaminants used in the early 1900s was now so remote as for them to be not considered potential contaminants of concern.

Based on the above information, the likelihood for widespread contamination is considered unlikely, considering the historical land use has been for cattle grazing.

11 General Notes

General

Geotechnical and environmental reports present the results of investigations carried out for a specific project and usually for a specific phase of the project (e.g. preliminary design). The report is based specific criteria, such as the nature of the project, underground utilities or scope of service limitations imposed by the Client. The report may not be relevant for other phases of the project (e.g. construction), after some time or where project details and clients change.

Soil and Rock Description

Soil and rock descriptions are based on AS1726-1993 using visual and tactile assessment except at discrete locations where field and/or laboratory tests have been carried out. Refer to the terms and symbols sheet for definitions.

Groundwater

The water levels indicated are taken at the time of measurement and depending on material permeability may not reflect the actual groundwater level at those specified locations. Also groundwater levels can vary with time due to seasonal or tidal fluctuation, construction activities and other external factors.

Interpretation of Results

The discussion and recommendations in the accompanying report are based on extrapolation/interpolation from data obtained at discrete locations and other external sources and guidelines. The actual interface between the materials may be far more gradual or abrupt than indicated. Also actual conditions in areas not sampled may differ from those predicted.

The report is based on significant background details that only the authors can be aware off, and therefore implementation of the recommendations by others may lead to misinterpretation and complications. Therefore this company should be consulted to explain the reports implications to other involved parties.

Reporting relies on interpretation of often limited factual information based on judgment and opinion which has a level of uncertainty and ambiguity attached to it, and is far less exact than other design disciplines. This should be considered by users of the report when assessing the implications of the recommendations.

Change in Conditions

Subsurface conditions can change with time and can vary between test locations. Construction operations at or adjacent to the site and natural events such as floods, earthquakes or groundwater fluctuations can also affect subsurface conditions.

8 Scope of Engagement

This report has been prepared by Ardill Payne & Partners (APP) at the request of Intrapac for the purpose of a Preliminary Contaminated Site Investigation and is not to be used for any other purpose or by any other person or corporation.

This report has been prepared from the information provided to us and from other information obtained as a result of enquiries made by us. APP accepts no responsibility for any loss or damage suffered howsoever arising to any person or corporation who may use or rely on this document for a purpose other than that described above.

APP declares that it does not have, nor expects to have, a beneficial interest in the subject project.

To avoid this advice being used inappropriately it is recommended that you consult with APP before conveying the information to another who may not fully understand the objectives of the report. This report is meant only for the subject site/project and should not be applied to any other.

9 References

Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) (2000). *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. ANZECC and ARMCANZ

Australian and New Zealand Environment and Conservation Council (ANZECC) and National Health and Medical Research Council (1992). *Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites*. Australian and New Zealand Environment and Conservation Council (ANZECC) and National Health and Medical Research Council, 57 p.

Council of Standards Australia (1997). *AS 4482.1 – 2005 Guide to the Sampling and Investigation of Potentially Contaminated Soil – Non-volatile and Semi-volatile Compounds.* Council of Standards Australia, 64 p.

Department of Urban Affairs and Planning (DUAP) and the Environmental Protection Authority (EPA), 1998. *Managing Land Contamination, Planning Guidelines SEPP 55 – Remediation of Land*

NSW DEC (2007). *Guidelines for the Assessment and Management of Groundwater Contamination.* NSW DEC

NSW DECC (2009). *Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997.* NSW DECC

NSW EPA (2000). *Contaminated Sites – Guidelines for the NSW Site Auditor Scheme (2nd Edn.).* NSW EPA

NSW EPA (1997). *Guidelines for Assessing Banana Plantation Sites.*NSW EPA

NSW EPA (2005). *Guidelines for Assessing Former Orchards and Market Gardens,* NSW EPA

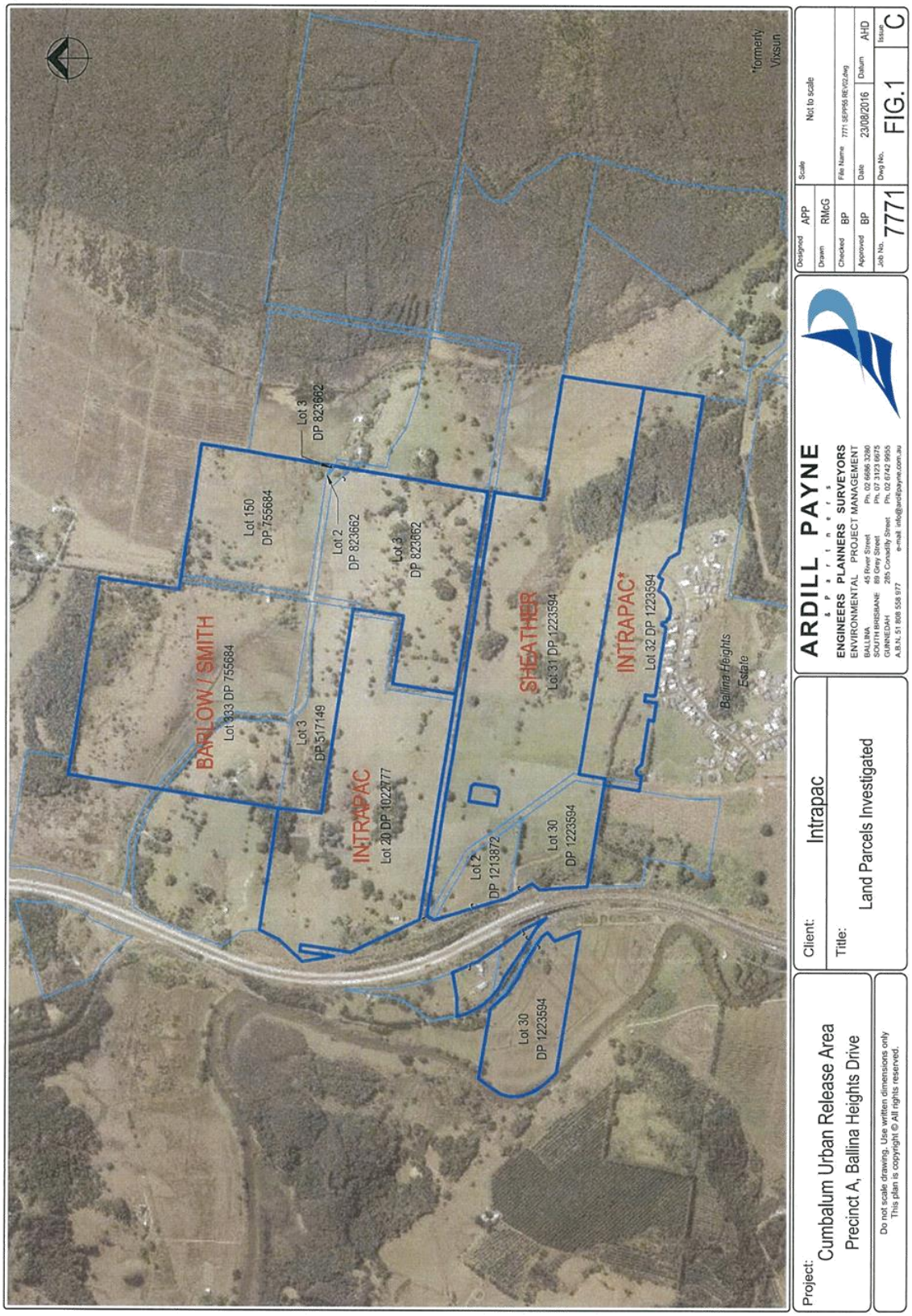
NSW EPA (2000) *Guidelines for Consultants Reporting on Contaminated Sites.* NSW EPA

10 Attachments

Attachment 1	Figures
Attachment 2	Site History Information

ATTACHMENT 1

Attachment 1: Figures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Lot 150 DP 755684
Lot 3 DP 517149
INTRAPAC
Lot 20 DP 1022777
Lot 3 DP 823662
Lot 2 DP 823662
Lot 3 DP 823662
Lot 2 DP 1213872
Lot 30 DP 1223594
Lot 30 DP 1223594
SHEATHER
Lot 31 DP 1223594
INTRAPAC*
Lot 32 DP 1223594
Ballina Heights Estate
*formerly Vixsun
Project: Cumbalum Urban Release Area Precinct A, Ballina Heights Drive
Client: Intrapac
Title: Land Parcels Investigated
ARDILL PAYNE & Partners
ENGINEERS PLANNERS SURVEYORS
ENVIRONMENTAL PROJECT MANAGEMENT
BALLINA 45 River Street Ph. 02 6686 3280
SOUTH BRISBANE 89 Grey Street Ph. 07 3123 9275
GUNNEDAH 285 Conadilly Street Ph. 02 6742 9955
A.B.N. 51 808 558 977 e-mail info@ardillpayne.com.au
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Approved BP
Job No. 7771
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File Name 7771 SEPP65 REV02.dwg
Date 23/08/2016
Datum AHD
Dwg No. FIG.1
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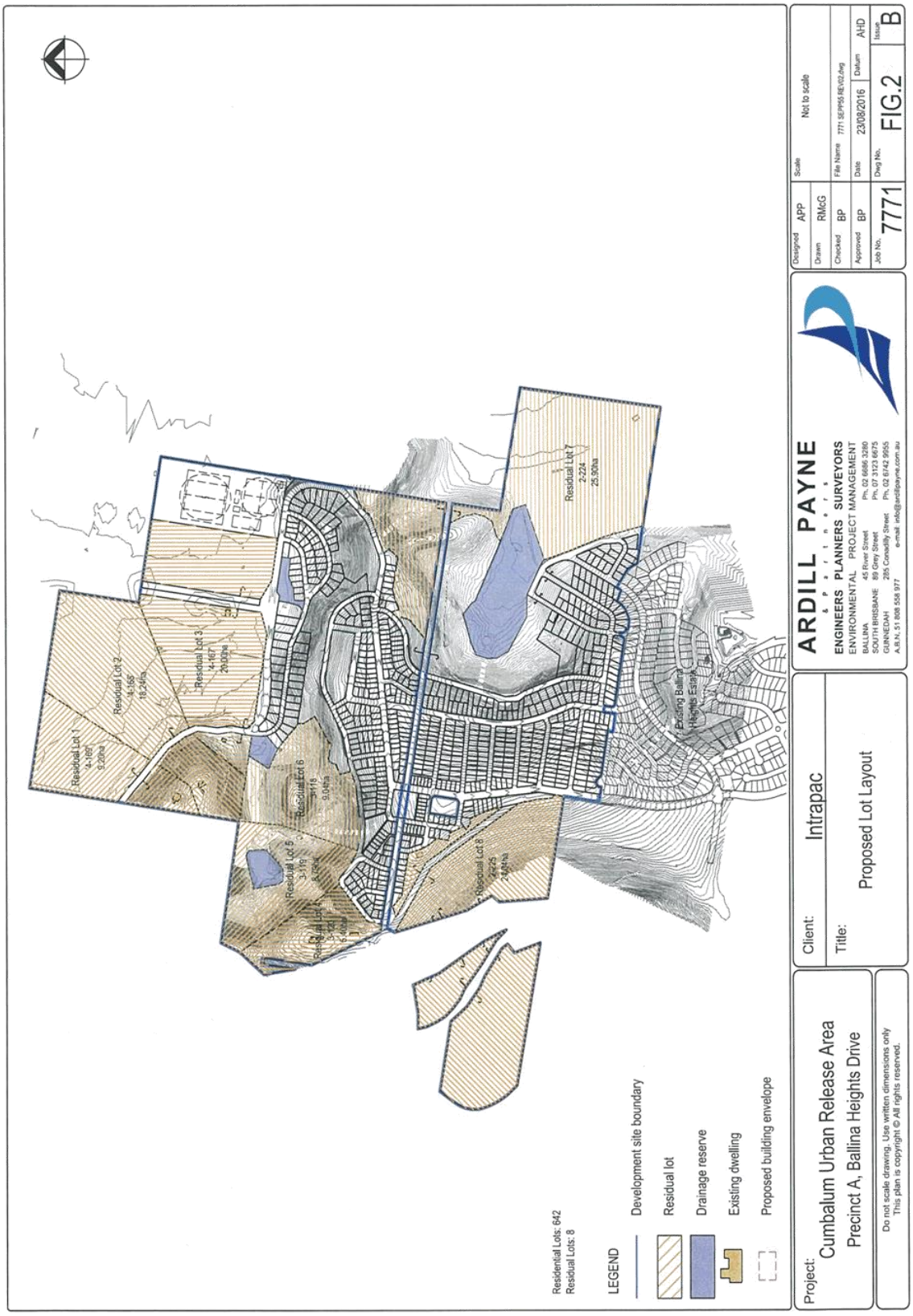
Residual Lot 1
4.1ha
9.28ha
Residual Lot 2
4.1ha
18.34ha
Residual Lot 3
4.167ha
26.00ha
Residual Lot 4
3.1ha
Residual Lot 5
3.1ha
Residual Lot 6
3.1ha
9.04ha
Residual Lot 7
2.224
25.90ha
Residual Lot 8
2.425
3.404ha
Existing Ballina Heights Estate
Residential Lots: 642
Residual Lots: 8
LEGEND
Development site boundary
Residual lot
Drainage reserve
Existing dwelling
Proposed building envelope
Project:
Cumbalum Urban Release Area
Precinct A, Ballina Heights Drive
Client:
Intrapac
Title:
Proposed Lot Layout
ARDILL PAYNE
& Partners
ENGINEERS PLANNERS SURVEYORS
ENVIRONMENTAL PROJECT MANAGEMENT
BALLINA 45 River Street Ph. 02 6686 3280
SOUTH BRISBANE 89 Grey Street Ph. 07 3123 6675
GUNNEDAH 285 Conadilly Street Ph. 02 6742 9955
A.B.N. 51 668 556 977 e-mail: info@ardillpayne.com.au
Designed APP
Drawn RMcG
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Approved BP
Job No. 7771
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File Name 7771 SEPP65 RE1V2.dwg
Date 23/08/2016
Datum AHD
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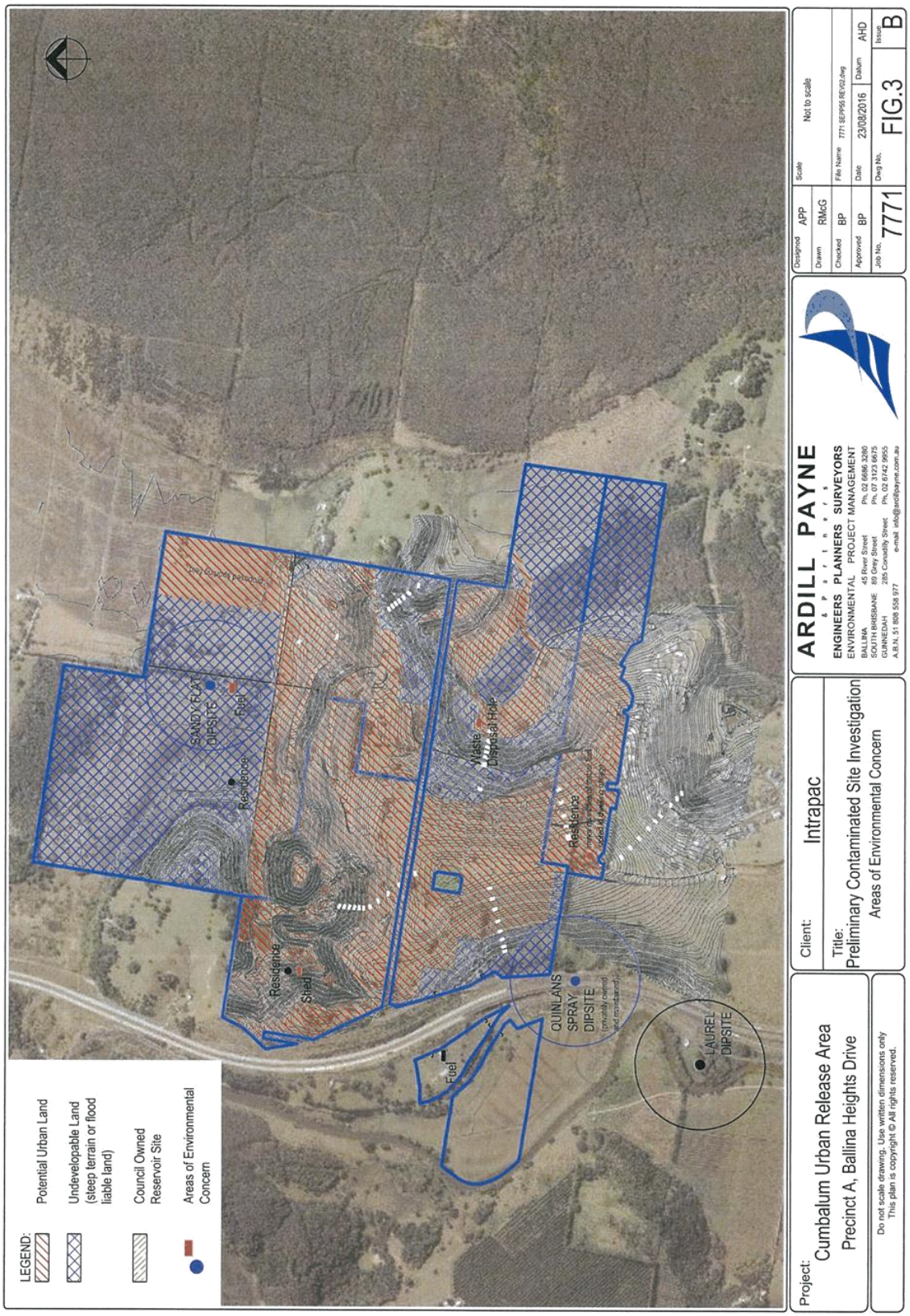
LEGEND:
Potential Urban Land
Undevelopable Land (steep terrain or flood liable land)
Council Owned Reservoir Site
Areas of Environmental Concern
SANDY FLAT DIPSITE
Fuel
Residence
Shed
Waste Disposal Hole
Residence
QUINLANS SPRAY DIPSITE
LAUREL DIPSITE
Project: Cumbalum Urban Release Area Precinct A, Ballina Heights Drive
Client: Intrapac
Title: Preliminary Contaminated Site Investigation Areas of Environmental Concern
ARDILL PAYNE & Partners
ENGINEERS PLANNERS SURVEYORS
ENVIRONMENTAL PROJECT MANAGEMENT
BALLINA 45 River Street Ph. 02 6686 3280
SOUTH BRISBANE 89 Grey Street Ph. 07 3123 6675
GUNNEDAH 285 Cowdilly Street Ph. 02 6742 9955
A.B.N. 51 808 558 977 e-mail info@ardillpayne.com.au
Designed APP
Drawn RMcG
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Approved BP
Job No. 7771
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File Name 7771 SEPP65 REV02.dwg
Date 23/08/2016
Datum AHD
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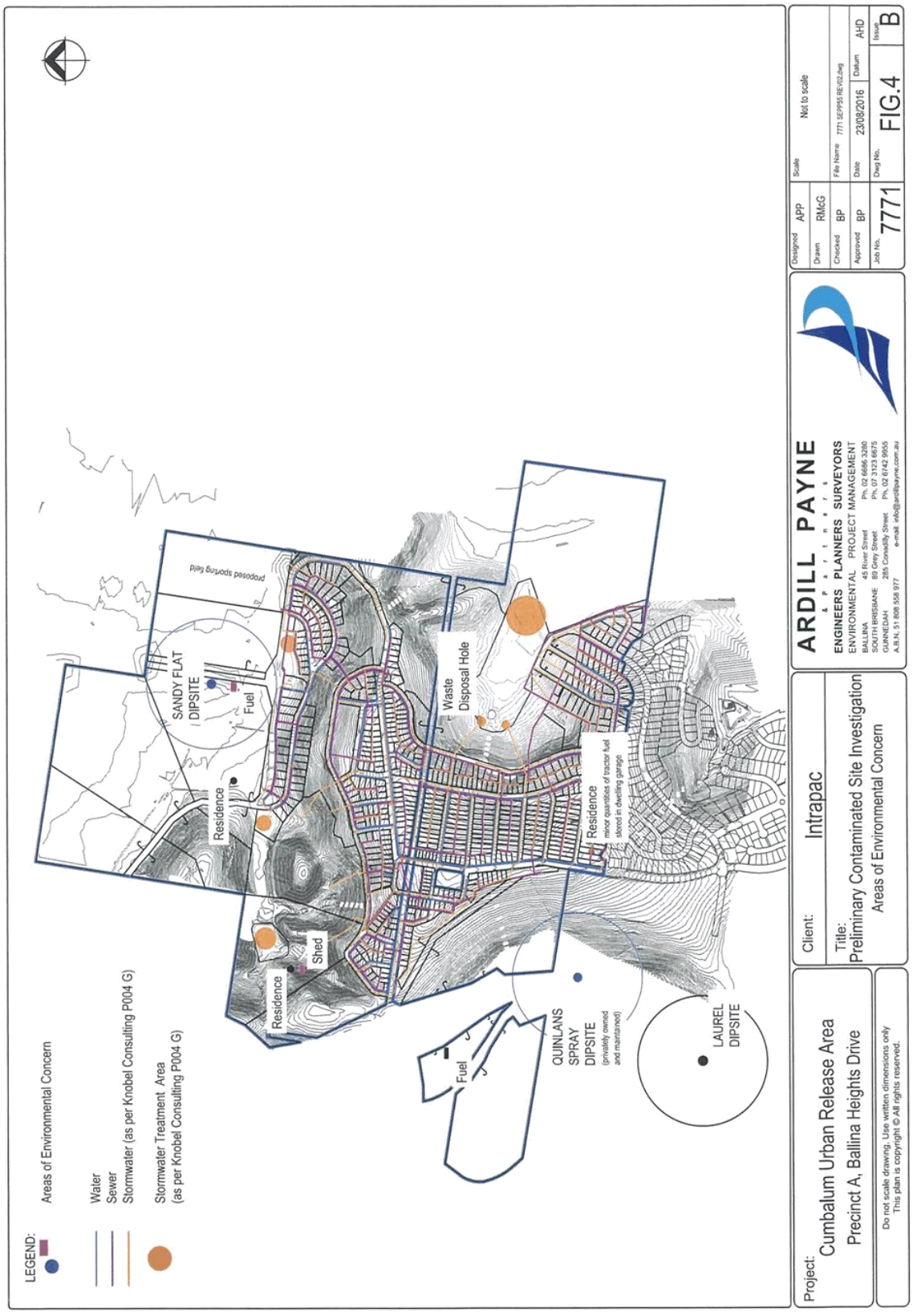
LEGEND:
Areas of Environmental Concern
Water
Sewer
Stormwater (as per Knobel Consulting P004 G)
Stormwater Treatment Area
(as per Knobel Consulting P004 G)
proposed sporting field
SANDY FLAT
DIPSITE
Fuel
Residence
Waste
Disposal Hole
Residence
minor quantities of tractor fuel
stored in dwelling garage
Shed
Residence
Fuel
QUINLANS
SPRAY
DIPSITE
(privately owned
and maintained)
LAUREL
DIPSITE
Project:
Cumbalum Urban Release Area
Precinct A, Ballina Heights Drive
Client:
Intrapac
Title:
Preliminary Contaminated Site Investigation
Areas of Environmental Concern
ARDILL PAYNE
& Partners
ENGINEERS PLANNERS SURVEYORS
ENVIRONMENTAL PROJECT MANAGEMENT
BALLINA 45 River Street Ph. 02 6686 3280
SOUTH BRISBANE 89 Grey Street Ph. 07 3123 6615
GUNNEDAH 285 Conadilly Street Ph. 02 6742 9955
A.B.N. 51 656 558 977 e-mail: info@ardillpayne.com.au
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Approved BP
Job No. 7771
Scale Not to scale
File Name 7771 SEPP55 REV02.dwg
Date 23/08/2016
Datum AHD
Dwg No. FIG.4
Issue B
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ATTACHMENT 2

Attachment 2: Site History Information

CUMBALUM REZONING – VIXSUN PROPERTY
– R.C.L. Property

SITE HISTORY ASSESSMENT

Land Use

- Chronological list of previous and present uses and zoning.
- State periods that you do not know what the site was used for.
- Attach additional sheets as necessary and any supporting documents, photographs, etc.

This and the following information has been received from Albert Sheaffe whose family owned the farm from 1946 until 1979 when it was sold to Mr & Mrs MARK PHELAN. The property was sold to S & C QUINLAN. in January 1988. VIXSUN purchased the property in 2003.

Since 1946 the subject land has been mainly used for cattle grazing. Some dairying occurred until around 1970.

The land was purchased by the Sheaffe family from Mc Cawleys. The land was overgrown with Lantana and other exotic species indicating the land had not been used for grazing or other agricultural uses for many years. It is believed that in the early 1900's the land was farmed by Hindus for cropping purposes.

The land is currently zoned 1(b) Rural - Secondary Agricultural Land.

Permits/Licences

- Provide details of any permits, licences, approvals etc for past site uses.

Nil.

Historical Use of Adjacent Land

- Brief overview of historical use of adjacent land.

Cattle grazing and some dairying.

Agriculture/horticulture

- Include dates and types of agricultural and/or horticultural uses, including crop types.
- Location of any dips. State if off-site.

Mark location(s) on the attached map, including areas used for horticulture/cropping.

There is a 'dip site' adjacent to R.C.S. property and adjacent to the Pacific Highway. This 'dip' is on land as owned by the RTA, and will be used for the "Ballina Bypass." See map.

Chemicals

- Provide list of any chemicals used on site, including agricultural chemicals (herbicides, dips etc).
- Provide details and location of any fuel and/or oil storage.
- State purpose and dates used.
- List storage, waste disposal areas, spills, and possible contaminant sources – on and off site.

Mark location(s) on attached map.

Chemicals used on site for Tick, buffalo fly etc - Amaucide 50, GRAZON, and BARRIACADE F. 2,4 D used to control lantana and crofton weed. No "BOOM" spraying has taken place - only "spot" spraying has occurred.

FUEL/OIL STORAGE. No known sheds or storage areas on site. Minimal amount of tractor fuel stored in brick & concrete garage of present home. No known spillages or contamination.

Tanks

- Provide details and locations of any current and former tanks – underground/above ground.

Mark location(s) on attached map.

There are TWO TANKS. An underground water storage tank adjacent to the current residence as well as a septic tank nearby. There are two water troughs for cattle watering. A well also exists for previous water gathering as indicated. see MAP.

Manufacturing/Industrial

- Description of any rural industries, processing or manufacturing activities on the site, including locations and dates.

Mark location(s) on attached map.

N/.

Asbestos

- Provide details of any asbestos used in past or present buildings.

Mark location(s) on attached map.

Nil.

Sewerage Disposal

- Describe any past and present sewerage disposal areas.

Mark location(s) on attached map.

Septic Tank as indicated.

Waste/Rubbish Disposal

- Location of any past or present waste disposal areas, dates of use, and types of materials disposed.

Mark location(s) on attached map.

Nil.

Indicators of Contamination

- Describe any areas of soil discolouration, bare soil patches, poor plant growth or stress, odours, complaints from neighbours etc.

Mark location(s) on attached map.

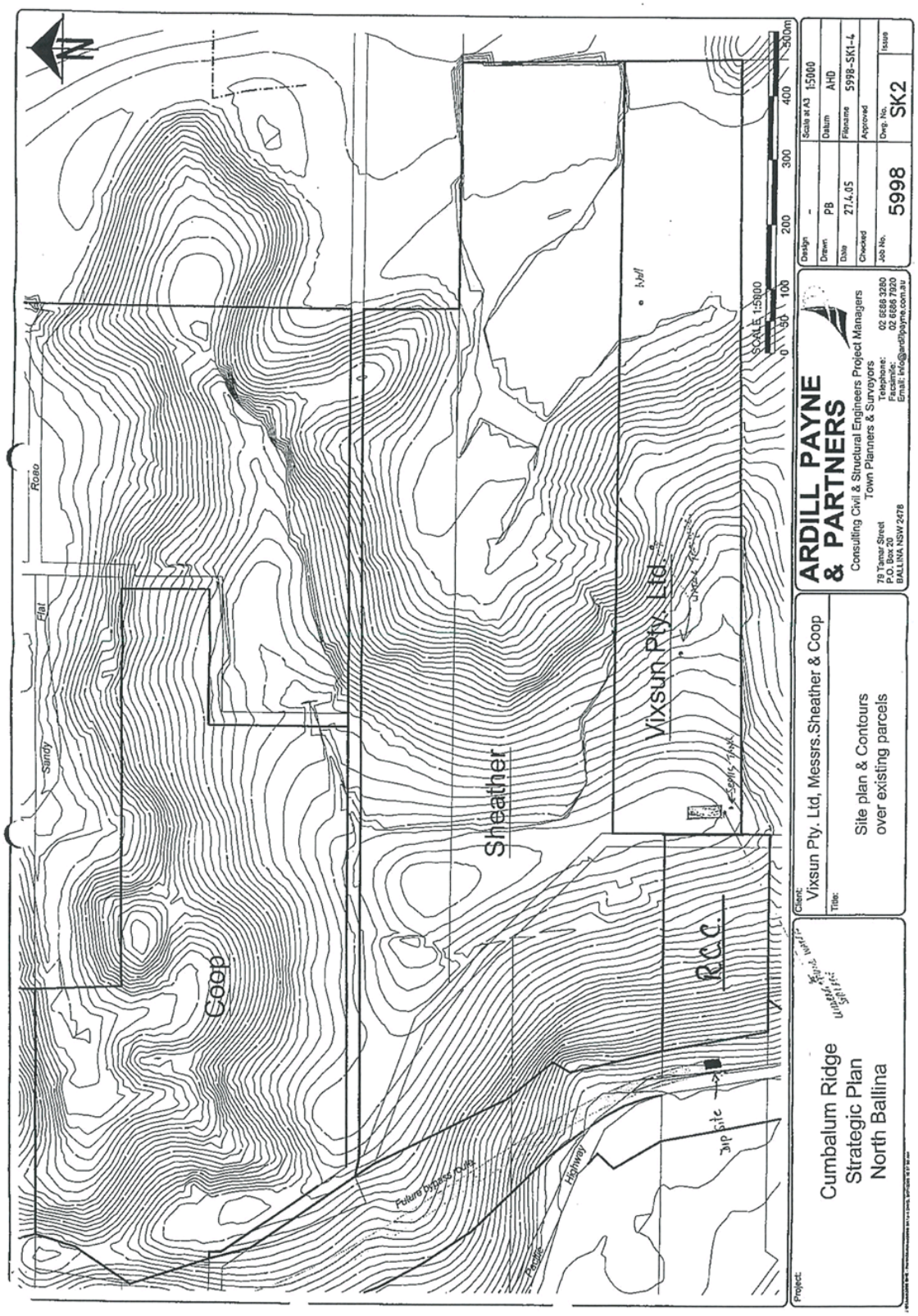
Any other pertinent information

Nil.

Name John Gates

Date 25.01.08.

Signature


Sheather
Vixsun Pty. Ltd.
Coop
R.C.C.
Sandy Flat
Road
Future Bypass Route
Highway
Site
SCALE 1:5000
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Project:
Cumbalum Ridge
Strategic Plan
North Ballina
Client:
Vixsun Pty. Ltd, Messrs.Sheather & Coop
Title:
Site plan & Contours
over existing parcels
ARDILL PAYNE & PARTNERS
Consulting Civil & Structural Engineers Project Managers
Town Planners & Surveyors
79 Tamar Street
P.O. Box 20
BALLINA NSW 2478
Telephone: 02 6686 3280
Facsimile: 02 6686 7920
Email: info@ardillpayne.com.au
Design -
Drawn PB
Date 27.4.05
Checked
Approved
Job No. 5998
Scale at A3 1:5000
Datum AHD
Filename 5998-SK1-4
Dwg. No. SK2
Issue

CUMBALUM REZONING – SHEATHER PROPERTY

SITE HISTORY ASSESSMENT

Land Use

- Chronological list of previous and present uses and zoning.
- State periods that you do not know what the site was used for.
- Attach additional sheets as necessary and any supporting documents, photographs, etc.

MY FAMILY MOVED TO CUMBALUM IN 1946 & ESTABLISHED A HOUSE & DAIRY ON THE "QUINLAN LAND" NOW "UIXSUN."

IN 1950 THE NEXT DOOR PROPERTY WAS PURCHASED & IT'S DAIRY SHUT DOWN & THIS ADDITIONAL LAND MADE IT A MORE VIABLE PROPOSITION TO RUN AS ONE. DAIRYING CEASED IN 1966.

IN 1972 I PURCHASED THE NEXT PORTION OF LAND & CLOSED DOWN THE DAIRY. BEEF CATTLE HAVE BEEN RUNNING ON BOTH THESE PROPERTIES SINCE THESE DATES & IS NOW RUN AS ONE BEEF PRODUCTION PROPERTY.

Permits/Licences

- Provide details of any permits, licences, approvals etc for past site uses.

NO OTHER USES

Historical Use of Adjacent Land

- Brief overview of historical use of adjacent land.

DAIRY FARMING TOOK UP THE WHOLE CUMBALUM RIDGE 60-70 YEARS AGO. YEARS BEFORE THAT WHILE UNDER ONE OWNERSHIP THE VIABLE PARTS OF THE LAND WERE FARMED BY HINDU'S WITH DRAUGHT HORSES GROWING VEGETABLES. ETC.

Agriculture/horticulture

- Include dates and types of agricultural and/or horticultural uses, including crop types.
- Location of any dips. State if off-site.

Mark location(s) on the attached map, including areas used for horticulture/cropping.

NO HORTICULTURE CROPPING KNOWN.

SPRAY DIP INSTALLED ON OUR ORIGINAL DAIRY SITE (QUINLAN LAND) NOW R.T.A. LAND.

Chemicals

- Provide list of any chemicals used on site, including agricultural chemicals (herbicides, dips etc).
- Provide details and location of any fuel and/or oil storage.
- State purpose and dates used.
- List storage, waste disposal areas, spills, and possible contaminant sources – on and off site.

Mark location(s) on attached map.

FARM CHEMICALS USED FOR LANTANA & CROFTON WEED WAS AMICIDE 50" & LATER GRAZON WHICH ALSO KILLED CAMPHOR LAUREL REGROTH & WILD TOBACCO BUSH. ALL CHEMICALS USED BY SPOT SPRAY METHOD, NO HIGH VOLUME OR LARGE QUANITIES USED. CONTROL OF TICKS & BUFFALO FLY ON CATTLE BY SIMILAR METHOD
DIESEL FUEL STORED IN 1000 LTR. TANK AT END OF TRACTOR SHED & OILS INSIDE.
USED TO FUEL TRACTOR FOR GENERAL FARM USE.
NO WASTE DISPOSAL AREAS.

Tanks

- Provide details and locations of any current and former tanks – underground/above ground.

Mark location(s) on attached map.

NO WATER TANKS.
ONE FUEL TANK.

Manufacturing/Industrial

- Description of any rural industries, processing or manufacturing activities on the site, including locations and dates.

Mark location(s) on attached map.

NOT KNOWN.

Asbestos

- Provide details of any asbestos used in past or present buildings.

Mark location(s) on attached map.

HOUSE BUILT IN 1946 ON ORIGIONAL DAIRY BLOCK FIBRO LINED INSIDE & OUT. NOW OWNED BY R.T.A.

Sewerage Disposal

- Describe any past and present sewerage disposal areas.

Mark location(s) on attached map.

SEPTIC SYSTEm SERVICING MY HOME SINCE 1975.

Waste/Rubbish Disposal

- Location of any past or present waste disposal areas, dates of use, and types of materials disposed.

Mark location(s) on attached map.

AT TIMES TRENCHES HAVE BEEN DUG. TO DISPOSE OF DEAD COWS OLD ROOFING IRON, BARBED WIRE ETC.

Indicators of Contamination

- Describe any areas of soil discolouration, bare soil patches, poor plant growth or stress, odours, complaints from neighbours etc.

Mark location(s) on attached map.

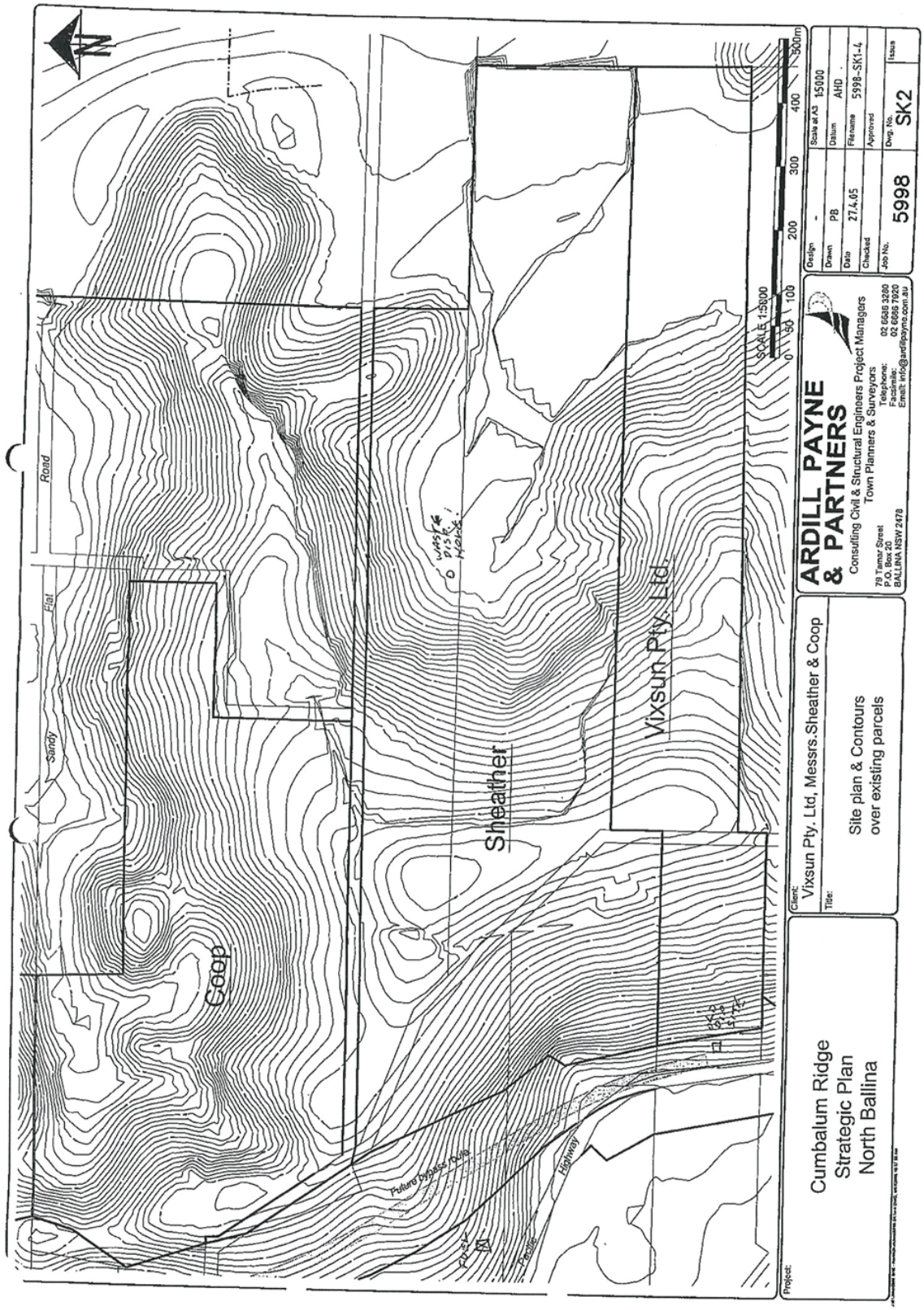
NOT KNOWN

Any other pertinent information

Name ALBERT SHEATHER

Date 1-8-05

Signature Albert E Sheather


Road
Flat
Sandy
Coop
Sheather
Vixsun Pty. Ltd.
Future Bypass Route
Highway
SCALE 1:5000
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Project:
Cumbalum Ridge
Strategic Plan
North Ballina
Client:
Vixsun Pty. Ltd, Messrs.Sheather & Coop
Title:
Site plan & Contours
over existing parcels
ARDILL PAYNE
& PARTNERS
Consulting Civil & Structural Engineers Project Managers
Town Planners & Surveyors
79 Tamar Street
P.O. Box 20
BALLINA NSW 2478
Telephone: 02 6686 3280
Facsimile: 02 6686 7920
Email: info@ardillpayne.com.au
Design -
Drawn PB
Date 27.4.05
Checked
Job No. 5998
Scale at A3 1:5000
Datum AHD
Filename 5998-SK1-4
Approved
Dwg No. SK2
Issue

5995
02.08.05

CUMBALUM REZONING – COOP PROPERTY

SITE HISTORY ASSESSMENT

Land Use

- Chronological list of previous and present uses and zoning.
- State periods that you do not know what the site was used for.
- Attach additional sheets as necessary and any supporting documents, photographs, etc.

— 1979 Dairy Farm – owner Leo Troy.
1979— Cattle Stud & R.& B.M. Coop
Beef Cattle

Uses up to 1979 unknown

Permits/Licences

- Provide details of any permits, licences, approvals etc for past site uses.

Historical Use of Adjacent Land

- Brief overview of historical use of adjacent land.

Not Known.

Agriculture/horticulture

- Include dates and types of agricultural and/or horticultural uses, including crop types.
- Location of any dips. State if off-site.

Mark location(s) on the attached map, including areas used for horticulture/cropping.

Dip on ajoining property Sandy Flat Rd.

Chemicals

- Provide list of any chemicals used on site, including agricultural chemicals (herbicides, dips etc).
- Provide details and location of any fuel and/or oil storage.
- State purpose and dates used.
- List storage, waste disposal areas, spills, and possible contaminant sources – on and off site.

Mark location(s) on attached map.

Fuel, oil drums stored in Shed.
Roundup weed spray gardens.
Grazon used regularly - weed & camphor control
Baracade Cattle spray for buffalo fly
used for last 2yrs before regular tagging
Auclox Bracken Spray not used in last 10yrs.
Bromicide 200, selective herbicide - not used in last 10yrs
Fernock water soluble herbicide - permanthrin grass
spray. - not used in last 7yrs

Tanks

- Provide details and locations of any current and former tanks – underground/above ground.

Mark location(s) on attached map.

Manufacturing/Industrial

- Description of any rural industries, processing or manufacturing activities on the site, including locations and dates.

Mark location(s) on attached map.

Asbestos

- Provide details of any asbestos used in past or present buildings.

Mark location(s) on attached map.

N.I.L

Sewerage Disposal

- Describe any past and present sewerage disposal areas.

Mark location(s) on attached map.

Septic Tank & rubble drains from residence.

Waste/Rubbish Disposal

- Location of any past or present waste disposal areas, dates of use, and types of materials disposed.

Mark location(s) on attached map.

Chemical drums disposed off at Council Tip. collection

Indicators of Contamination

- Describe any areas of soil discolouration, bare soil patches, poor plant growth or stress, odours, complaints from neighbours etc.

Mark location(s) on attached map.

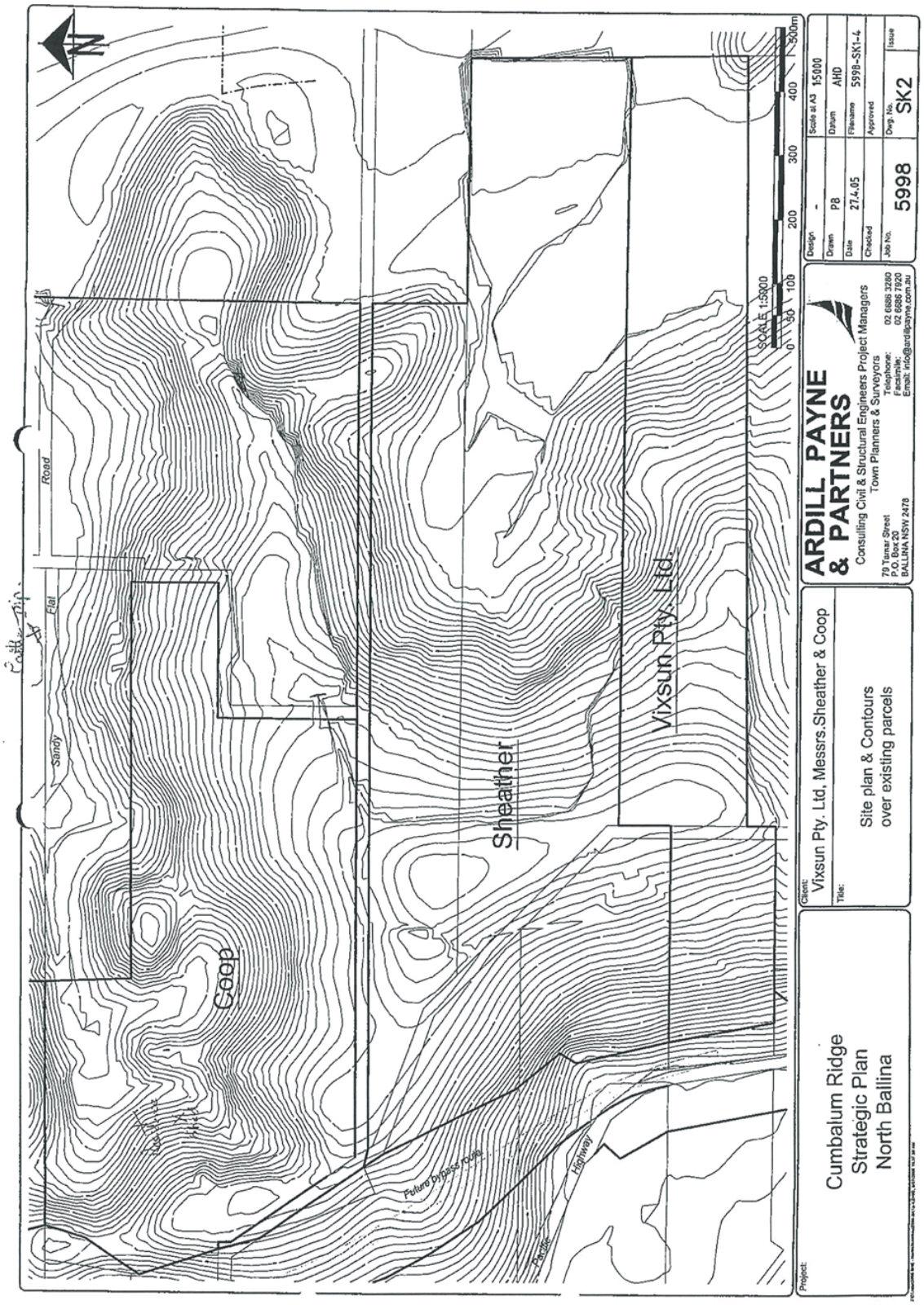
Nil

Any other pertinent information

Name B.M. Coop.

Date 1/8/05

Signature B.M. Coop.


Coop
Sheather
Vixsun Pty. Ltd.
Sandy Flat Road
Future Bypass route
Pacific Highway
SCALE 1:5000
0 50 100 200 300 400 500m
Project:
Cumbalum Ridge
Strategic Plan
North Ballina
Client:
Vixsun Pty. Ltd, Messrs.Sheather & Coop
Title:
Site plan & Contours
over existing parcels
ARDILL PAYNE
& PARTNERS
Consulting Civil & Structural Engineers Project Managers
Town Planners & Surveyors
79 Tamar Street
P.O. Box 20
BALLINA NSW 2478
Telephone: 02 6686 3280
Facsimile: 02 6686 7920
Email: info@ardillpayne.com.au
Design -
Drawn PB
Date 27.4.05
Checked
Approved
Job No. 5998
Scale at A3 1:5000
Datum AHD
Filename 5998-SK1-4
Dwg No. SK2
Issue

CUMBALUM REZONING – BARLOW PROPERTY

SITE HISTORY ASSESSMENT

Land Use

- Chronological list of previous and present uses and zoning.
- State periods that you do not know what the site was used for.
- Attach additional sheets as necessary and any supporting documents, photographs, etc.

FARM PURCHASED 1971
USED FOR BEEF CATTLE UNTIL PRESENT DAY

PRIOR TO 1971 USED FOR DAIRY CATTLE
LATER FOR BEEF

Permits/Licences

- Provide details of any permits, licences, approvals etc for past site uses.

N/A

Historical Use of Adjacent Land

- Brief overview of historical use of adjacent land.

UNKNOWN

Agriculture/horticulture

- Include dates and types of agricultural and/or horticultural uses, including crop types.
- Location of any dips. State if off-site.

Mark location(s) on the attached map, including areas used for horticulture/cropping.

USED ONLY FOR BEEF CATTLE
DIP LOCATION AS SHOWN ON MAP
DIP HAS RECENTLY BEEN DE-COMMISSIONED
DIP CONFINED TO PRESENT FENCES
DIP BATH SEALED

Chemicals

- Provide list of any chemicals used on site, including agricultural chemicals (herbicides, dips etc).
- Provide details and location of any fuel and/or oil storage.
- State purpose and dates used.
- List storage, waste disposal areas, spills, and possible contaminant sources – on and off site.

Mark location(s) on attached map.

SPOT SPRAYING - CHEMICALS USED - ROUNDUP, GRAZON, AMICIDE 625

FUEL STORED IN 1000L TANK LOCATED AT SHED ADJACENT TO FORMER DIP SITE

Tanks

- Provide details and locations of any current and former tanks – underground/above ground.

Mark location(s) on attached map.

AS STATED ABOVE

Manufacturing/Industrial

- Description of any rural industries, processing or manufacturing activities on the site, including locations and dates.

Mark location(s) on attached map.

Asbestos

- Provide details of any asbestos used in past or present buildings.

Mark location(s) on attached map.

WORKERS COTTAGE - FIBRO

ASBESTOS CONTENT UNKNOWN

Sewerage Disposal

- Describe any past and present sewerage disposal areas.

Mark location(s) on attached map.

SEPTIC TRENCHES AT HOUSES

Waste/Rubbish Disposal

- Location of any past or present waste disposal areas, dates of use, and types of materials disposed.

Mark location(s) on attached map.

N/A

Indicators of Contamination

- Describe any areas of soil discolouration, bare soil patches, poor plant growth or stress, odours, complaints from neighbours etc.

Mark location(s) on attached map.

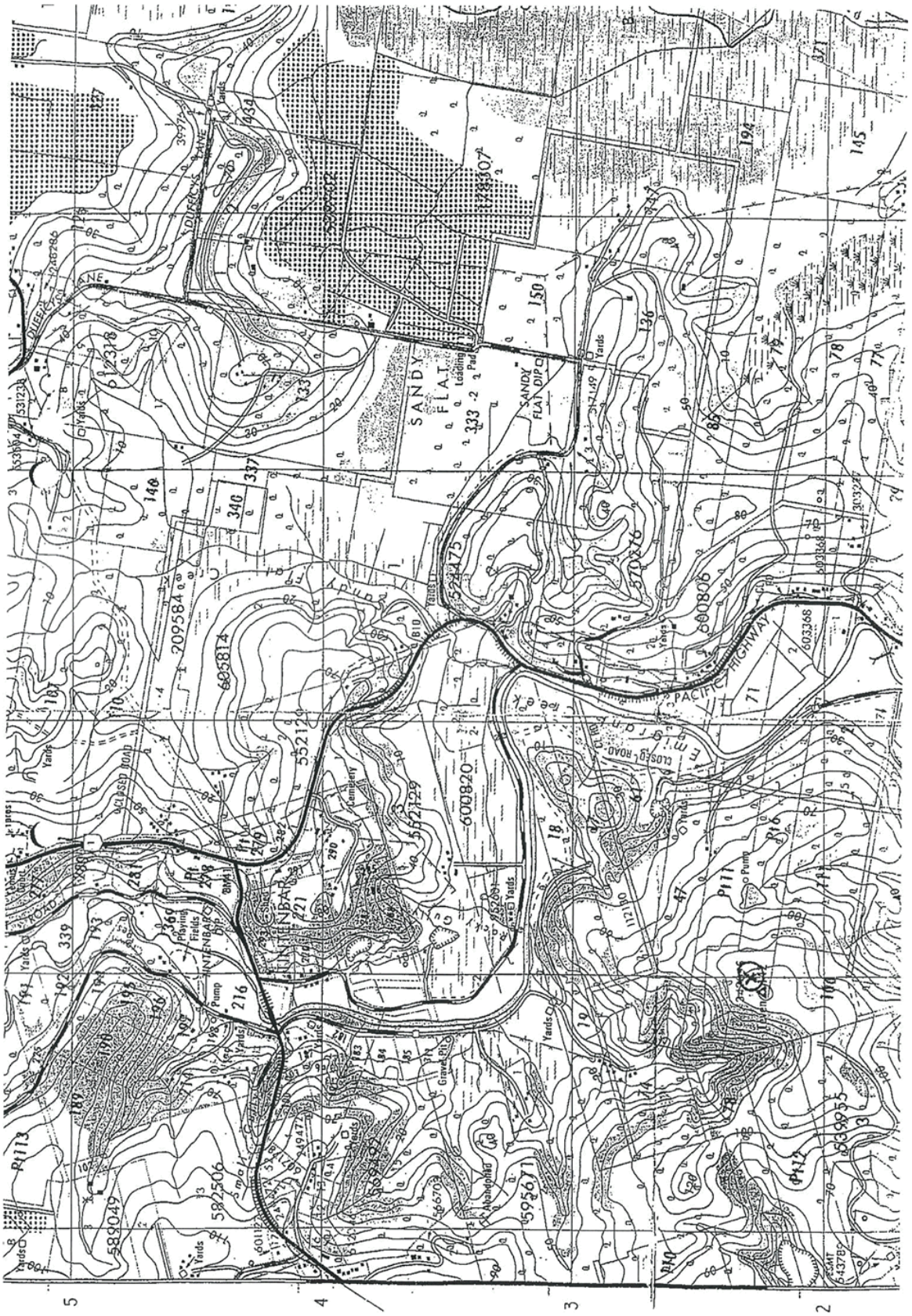
UNKNOWN

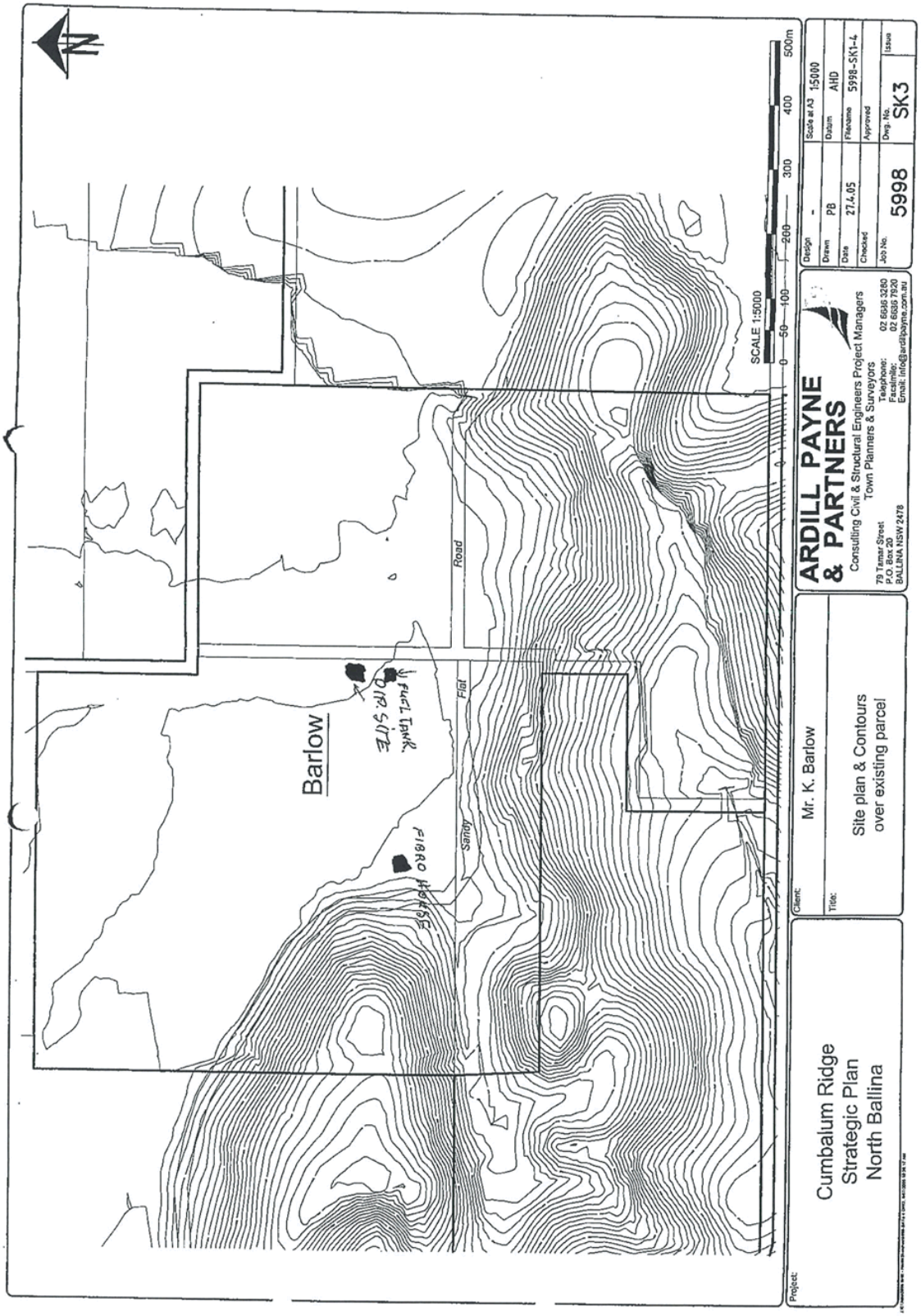
Any other pertinent information

Name KEITH BARLOW

Date 11-8-05

Signature Keith A Barlow


SANDY FLAT
PACIFIC HIGHWAY
TINTENBAR ROAD
Playing Fields
Pump
Gravel Pit
Abandoned
Yards
5
4
3
2


Barlow
Road
Flat
Sandy
Fibro House
Fuel Tank
Dip Site
SCALE 1:5000
0 50 100 200 300 400 500m
ARDILL PAYNE & PARTNERS
Consulting Civil & Structural Engineers Project Managers
Town Planners & Surveyors
78 Tamar Street
P.O. Box 20
BALLINA NSW 2478
Telephone: 02 6686 3280
Facsimile: 02 6686 7920
Email: info@ardillpayne.com.au
Client: Mr. K. Barlow
Title: Site plan & Contours over existing parcel
Project: Cumbalum Ridge Strategic Plan North Ballina
Design -
Drawn PB
Date 27.4.05
Checked
Approved
Job No. 5998
Scale at A3 1:5000
Datum AHD
Filename 5998-SK1-4
Dwg. No. SK3
Issue

Road Traffic Noise Assessment

Proposed Residential Zoned Land

At Lot 1 DP1077982 Ballina Heights Drive, Cumbalum

On behalf of St Francis Xavier Catholic Parish Ballina

19GCA0089 R01_2

ttm

About TTM

For 30 years, we've been at the centre of the Australian development and infrastructure industry. Our unique combination of acoustics, data, traffic and waste services is fundamental to the success of any architectural or development project.

We have over 50 staff, with an unrivalled depth of experience. Our industry knowledge, technical expertise and commercial insight allow us to deliver an exceptional and reliable service.

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Revision Record

No.	Author	Reviewed/Approved	Description	Date
A.	J. Fox		Internal draft	28/08/2019
0.	J. Fox		Issued to client	28/08/2019
1.	J. Fox		Acoustic Report	22/05/2020
2.	J. Fox		Acoustic report – updated plan	11/06/2020
3.				
4.				

41A Quay Street, Sanctuary Cove. PO Box 930 Sanctuary Cove QLD 4212

Executive Summary

TTM conducted a road traffic noise assessment of the proposed land rezoning for the northern part of Lot 1 DP1077982 Ballina Heights Drive, Cumbalum. The report has assessed road traffic noise levels from the Pacific Motorway and Ballina Heights Drive.

Noise monitoring was undertaken to establish the existing noise levels and the applicable noise criteria. Modelling showed that road traffic noise levels were predicted to exceed the derived external noise criteria in some instances. Acoustic barriers on the western boundary were found to be generally ineffective at reducing road traffic noise levels across the site due to the undulating terrain. Despite this, all lots are predicted to have an area of compliant outdoor space due to shielding provided by building structures.

Noise affected lots were identified and a site-specific acoustic assessment is recommended for these lots once building plans are available.

Compliance with the noise criteria is predicted to be achieved based on the implementation of the recommendations outlined in this report.

ttm

Contents

Table Index

Figure Index

1 Introduction

1.1 Background

TTM was engaged by St Francis Xavier Catholic Parish Ballina to undertake a road traffic noise assessment of land rezoning for the northern part of Lot 1 DP1077982 Ballina Heights Drive, Cumbalum. The land is currently zoned RU2 Rural Landscape and is proposed to be rezoned for residential purposes. This report will form part of the application for consideration by Ballina Shire Council.

1.2 References

The assessment is based on the following:

- Noise criteria outlined in Section 5, including:
  - *NSW Road Noise Policy, 2011*;
  - *State Environmental Planning Policy (Infrastructure) 2007*, Part 3, Division 17, Clause 102;
  - NSW Department of Planning *Development near Rail Corridors and Busy Roads – Interim Guideline*;
  - Development plan and information provided by Ardill Payne;
- Site inspection, noise measurements, analysis and calculations conducted by TTM.

1.3 Scope

The assessment includes the following:

- Description of the development site and proposal.
- Measurement of existing road traffic noise levels and statement of assessment criteria relating to road traffic noise intrusion.
- Prediction and analysis of road traffic noise impacts on the development.
- Details of noise control recommendations to be incorporated to achieve predicted compliance.

2 Site Description

2.1 Site Location

The site is described by the following:

- Lot 1 DP1077982
- Ballina Heights Drive, Cumbalum NSW 2478

The site locality is shown in Figure 1.

Figure 1: Site Locality

2.2 Description of Surrounding Area

The site is bound by Ballina Heights Drive to the east, future development to the south, Mitchell Close and Pacific Motorway to the west and vacant land to the north. The current acoustic environment at the site is primarily comprised of road traffic noise from the Pacific Motorway and the natural environment such as wind in vegetation and birds chirping.

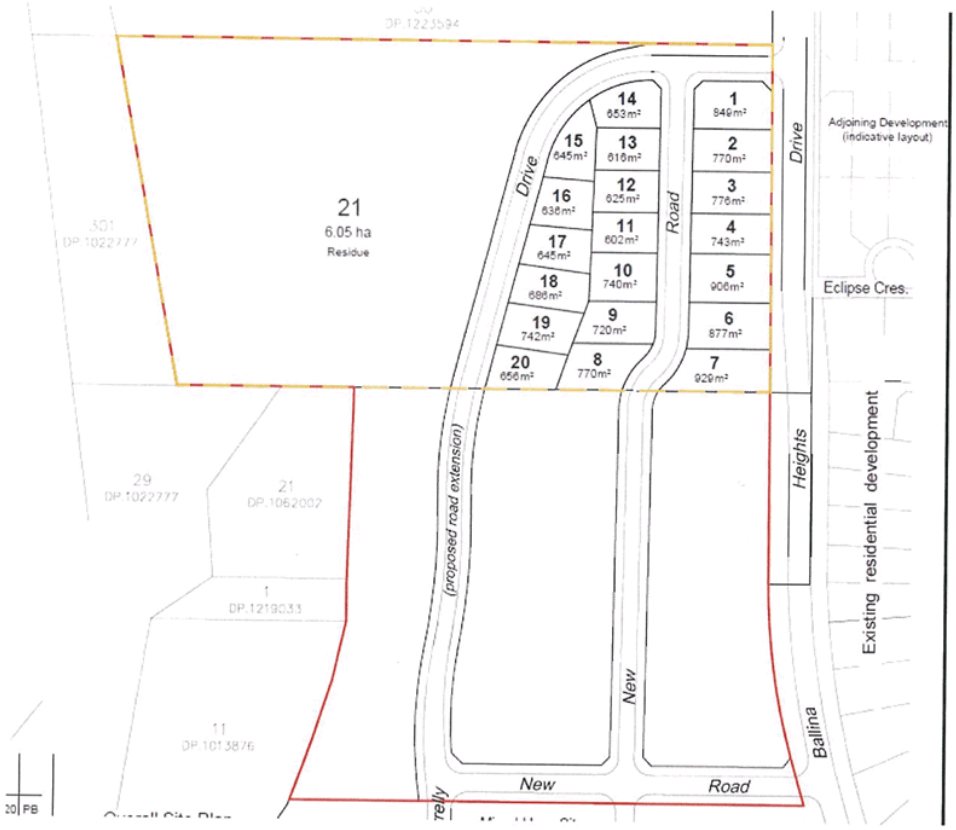
3 Proposed Development

3.1 Development Description

This proposal is to rezone the existing RU2 Rural Landscape zoned land into residential. The current development plan is for a 20 lot subdivision. Access is proposed from Ballina Heights Drive.

The development plan is shown in Figure 2 below.

Figure 2: Proposed Development Plan



4 Noise Measurements

4.1 Equipment

The following equipment was used to measure existing noise levels:

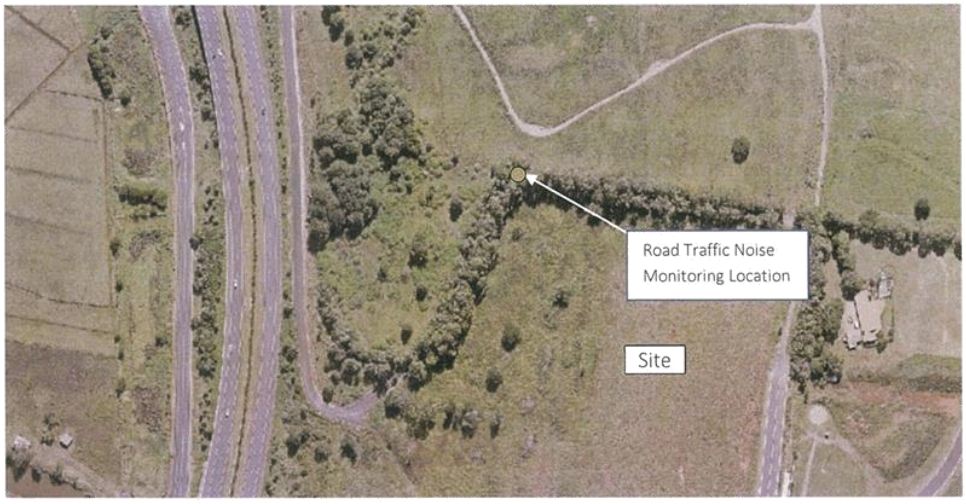
- ARL EL316 Environmental Noise Logger (SN# 16-707-039).
- RION NA-28 sound level meter (SN# 1060055).
- RION NC-74 Acoustical Calibrator (SN# 35073393).

All equipment was calibrated by a National Association of Testing Authorities (NATA) accredited laboratory. The equipment was calibrated before and after the measurement session. No significant drift from the reference signal was recorded.

4.2 Unattended Noise Monitoring

Unattended noise monitoring was undertaken to measure the existing road traffic noise levels between Monday 22/07/2019 and Friday 2/08/2019. The noise monitoring location is shown in Figure 3. The noise monitor was placed along the northern property boundary approximately 170m from the nearest lane of the Pacific Motorway. The microphone was in a free-field position, approximately 1.4m above ground and had an unobstructed view of the motorway.

Figure 3: Noise Monitoring Location



The noise monitor was set to measure statistical noise levels in 'A' weighting, 'Fast' response, over 15 minute intervals. Road traffic noise levels were measured in accordance with Australian Standard AS2702[1]. Weather conditions for the days used for road traffic noise verification were fine and suitable for noise measurement.

Weather during the monitoring period was generally fine with rainfall experienced on the 25th and 31st July and the 1st August 2019. Rain affected data was excluded from the analysis. The temperature range during the monitoring period was between 5-25°C (source: Bureau of Meteorology, Ballina Airport).

4.3 Results of Noise Measurements

4.3.1 Road Traffic Noise Levels

Table 1 presents the measured road traffic noise levels at the noise monitoring location. Graphical presentation of the measured noise levels is shown in Appendix A.

Table 1: Measured Road Traffic Noise Levels

Day and Date	Road Traffic Noise Descriptor	Time Period	Measured Level dB(A)
Average of clear measurement days, 23rd July to 30th July 2019	$L_{A10,18\ hour}$	6am to midnight	59
	$L_{Aeq,\ DAY\ 1\ hour\ (average\ maximum)}$	7am to 10pm	59
	$L_{Aeq,\ NIGHT\ 1\ hour\ (average\ maximum)}$	10pm to 7am	55
	$L_{Aeq,15\ hour}$	7am to 10pm	57
	$L_{Aeq,9\ hour}$	10pm to 7am	54

[1] Australian Standard *AS2702:1984 Acoustics – Methods for the measurement of road traffic noise*

5 Noise Criteria

5.1 Road Traffic Noise

The following policies/guidelines were referenced to determine the road traffic noise assessment criteria for the development:

- *NSW Road Noise Policy, 2011*;
- *State Environmental Planning Policy (Infrastructure) 2007*, Part 3, Division 17, Clause 102;
- NSW Department of Planning *Development near Rail Corridors and Busy Roads – Interim Guideline*.

The road traffic noise criterion for new residential developments is specified in the *State Environmental Planning Policy (Infrastructure) 2007* (Infrastructure SEPP). The Infrastructure SEPP prescribes internal noise goals for new residential developments which have been used as a basis for determining the acoustic attenuation recommendations at this development. The current *NSW Road Noise Policy* does not provide external noise limits for new residential developments and only provides external criteria for road upgrades impacting existing residences.

5.1.1 External Planning Noise Criteria

Given this report assesses a greenfield site for rezoning purposes it is considered reasonable to determine an appropriate noise criterion for external areas (i.e. private outdoor space of dwellings). While the *NSW Road Noise Policy* does not provide an external noise criterion for new residential developments it does specify criteria for existing residences affected by road noise which is considered appropriate in this instance. As the Pacific Highway is an existing freeway, Assessment Criteria 2 is chosen as the external noise criteria for this development.

Table 2: Road Traffic Noise Assessment Criteria for Residential Land Uses

Road category	Type of project/land use	Assessment criteria – dB(A)	
		Day (7 a.m.–10 p.m.)	Night (10 p.m.–7 a.m.)
Freeway/ arterial/ sub-arterial roads	1. Existing residences affected by noise from new freeway/arterial/sub-arterial road corridors	$L_{Aeq,\ (15\ hour)}$ 55 (external)	$L_{Aeq,\ (9\ hour)}$ 50 (external)
	2. Existing residences affected by noise from redevelopment of existing freeway/arterial/sub-arterial roads	$L_{Aeq,\ (15\ hour)}$ 60 (external)	$L_{Aeq,\ (9\ hour)}$ 55 (external)
	3. Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments		
Local roads	4. Existing residences affected by noise from new local road corridors	$L_{Aeq,\ (1\ hour)}$ 55 (external)	$L_{Aeq,\ (1\ hour)}$ 50 (external)
	5. Existing residences affected by noise from redevelopment of existing local roads		
	6. Existing residences affected by additional traffic on existing local roads generated by land use developments		

Note: Land use developers must meet internal noise goals in the Infrastructure SEPP (Department of Planning NSW 2007) for sensitive developments near busy roads (see Appendix C10).

These criteria are assessed against façade-corrected noise levels when measured in front of a building façade in accordance with the Policy.

Using the measured difference between the $L_{10\ (18\ hour)}$ and $L_{eq\ (15\ hour)}$ and $L_{eq\ (9\ hour)}$, the external $L_{10\ 18\ hour}$ limits for protection of dwelling private outdoor space can be derived to be 62dB(A) for daytime and 60dB(A) for night-time. The night criterion is the limiting factor therefore the external assessment criteria is a façade corrected level of 60dB(A) $L_{10(18\ hour)}$.

5.1.2 Internal Noise Criteria

While implementation of the Infrastructure SEPP requirements are mandatory only for noise sensitive developments near highly trafficked roads (i.e. roads with an annual average daily traffic (AADT) volume of greater than 40,000 vehicles), the design advice offered in the SEPP may be useful when designing noise sensitive developments near other roads such as the Pacific Highway.

For the assessment of noise sensitive internal spaces, we recommend application of the criteria specified in the NSW Department of Planning document, *Development near Rail Corridors and Busy Roads – Interim Guideline*. Table 3.1 from Section 3.6 of the guideline is reproduced below.

Table 3: Internal Noise Limits from Development near Rail Corridors and Busy Roads – Interim Guideline

Table 3.1: Noise criteria

Residential Buildings			
Type of occupancy		Noise Level dBA	Applicable time period
Sleeping areas (bedroom)		35	Night 10 pm to 7 am
Other habitable rooms (excl. garages, kitchens, bathrooms & hallways)		40	At any time
Non-Residential Buildings			
Type of occupancy			Recommended Max Level dBA
Educational Institutions including child care centres			40
Places of Worship			40
Hospitals	- Wards		35
	- Other noise sensitive areas		45

Note: airborne noise is calculated as L_{eq} (9h) (night) and L_{eq} (15h)(day). Groundborne noise is calculated as L_{max} (slow) for 95% of rail pass-by events.

Internal compliance is predicted to be achieved when external noise impacts are 60 dB(A) $L_{10\ 18\ hour}$ façade corrected or less. This is based on dwellings of standard building construction with windows and doors closed. Therefore, when compliance is achieved against the external criteria noted above, compliance is also predicted to be achieved for internal spaces of dwellings when windows and doors are closed.

6 Road Traffic Noise Assessment

An assessment of road traffic noise impacts from the Pacific Highway and Ballina Heights Drive upon the development was conducted to determine the acoustic treatments required for compliance with the criteria.

6.1 Traffic Volumes

Table 4 presents the traffic volumes used in the noise model.

Traffic volumes for the Pacific Motorway (200m north of Sandy Flat Road) were sourced from an acoustic report prepared by CRG (ref: 10191a Report CURA-A) dated September 2016. These traffic volumes were taken the *Pacific Highway Upgrade Ballina Bypass – Post construction operational noise assessment* May 2014 completed by AECOM Australia Pty Ltd for Ballina Bypass Alliance. The projected future year traffic volumes are based on a 3.5% annual compound growth rate of the traffic data presented in the AECOM May 2014 report.

The traffic data sourced from the CRG acoustic report was compared to the Roads and Maritime Services Traffic Volume Viewer with counts at Bridge Drive, Wardell. A count of 13,470 vehicles per day (vpd) was obtained in 2019 which is 1,953 vpd less than projected traffic volumes at the site. This difference is considered realistic given a number of vehicles are expected to exit the Motorway at Cumbalum, Ballina and the Bruxner Highway south of the site.

Traffic volumes for Ballina Heights Drive were also taken from the acoustic report prepared by CRG (ref: 10191a Report CURA-A) dated September 2016. Traffic modelling commissioned by Ballina Shire Council in 2014 predicts the existing section of Ballina Heights Drive (south of Unara Parkway) will ultimately carry 5,857 vpd. TPS Group Traffic Engineers project that the new section of Ballina Heights Drive (north of Unara Parkway) will ultimately carry approximately 2,100 vpd.

Table 4: Traffic Volumes used in the Noise Model

Road	Traffic Volumes (AADT)			Heavy Vehicles (%)
	2012	2019	2030	
Pacific Highway (200m north of Sandy Flat Road)	12,122	15,423	22,516	17.0
Ballina Heights Drive (South of Unara Parkway)	-	-	5,857	2.0
Ballina Heights Drive (North of Unara Parkway)	-	-	2,100	2.0

The 18 hour traffic volumes used in the noise model are taken to be 95% of the AADT.

6.2 Noise Prediction Model

6.2.1 Noise Modelling Parameters

Road traffic noise predictions were conducted using 'SoundPLAN v8.0', a CoRTN based modelling program. The basis of the 'SoundPLAN' model is as follows:

Table 5: Road Traffic Noise Modelling Parameters

Description	Value
Noise modelling standard	CoRTN
Angle increment	1°
Grid spacing (noise maps)	2m squares
Road surface type	Impervious (+0dB(A))
Ground contours	Based on 3D AutoCAD files (supplied by Ardill Payne) and Ballina Shire Council IntraMaps
Pacific Highway speed limit	110km/h
Ballina Heights Drive speed limit	60km/h
Noise source height above grade	0.5m
Residential floor heights	2.8m
Private outdoor space receiver height	1.5m above pad levels
Ground floor façade receiver height	1.8m above pad levels
First floor façade receiver height	4.6m above pad levels
Façade correction	+2.5dB(A)

6.2.2 Noise Model Verification

To verify the road traffic noise model, the $L_{A10,\ 18\ Hour}$ noise level was modelled and compared to the measured levels presented in Table 1. As the noise monitor was in a free-field location, the predicted noise level is also shown as free-field. Noise modelling results are shown in Appendix B.

Table 6: Comparison between measured and modelled road traffic noise level

Logger Location	Measured $L_{A10,\ 18\ Hour}$	Predicted $L_{A10,\ 18\ Hour}$	Model Correction	Corrected $L_{A10,\ 18\ Hour}$
170m from Pacific Hwy	59.4	61.6	-1.5	60.1

The noise model was over-predicting the measured noise level by greater than 2dB(A) using the current traffic volumes and posted speed limit. Therefore a -1.5dB correction was applied to the model to better reflect the actual measured noise level whilst still providing a conservative assessment.

6.3 Predicted Road Traffic Noise Levels

SoundPLAN noise modelling was conducted to predict road traffic noise levels at the development in the 10-year planning horizon (year 2030). Modelling was conducted without acoustic treatment to determine noise impacts across the site. The noise criteria for external compliance was derived to be a façade corrected level of 60dB(A) $L_{10\ (18\ hour)}$. This level predicts compliance with the $L_{Aeq\ (15\ hour)}$ and $L_{Aeq\ (9\ hour)}$ criteria detailed in Section 5.1.

6.3.1 Private Outdoor Space

Figure 4 presents the road traffic noise contours at ground floor private outdoor space level with no acoustic barriers.

Figure 4: Predicted Ground Floor Private Outdoor Space Road Traffic Noise Levels – No Acoustic Barriers

Modelling shows that road traffic noise levels are predicted to exceed the external criteria at lots on the western side of the development. Given the orientation of future dwellings (garages and entry facing west) on Lots 15-20, outdoor recreation areas will be shielded by the building and are expected to comply. With the inclusion of a dwelling onsite, all lots are predicted to have an area of compliant outdoor space.

Due to the undulating nature of the site which rises significantly from the Pacific Motorway towards Ballina Heights Drive in the east, large height acoustic barriers located on the western boundary are predicted to provide negligible benefit to the site. Noise modelling inclusive of an acoustic barrier on the western boundary was conducted as a guide to show the effect of a barrier in relation of the undulating nature of the terrain. For the purposes of modelling a barrier height of 5m was chosen.

Figure 5 shows the effect of a 5m high acoustic barrier located on the western boundary of the site.

Figure 5: Predicted Ground Floor Private Outdoor Space Road Traffic Noise Levels – With Acoustic Barriers

The noise modelling shows that with an acoustic barrier (5m high) on the western boundary there is negligible noise reduction benefit across the site. Therefore, it is considered impractical to construct an acoustic barrier at this location based on the natural terrain levels and this assessment will consider the results excluding barriers. It is noted that once earthwork levelling is conducted for the site, the benefit achieved by acoustic barriers in selected locations may be improved and barriers may be reconsidered at this stage.

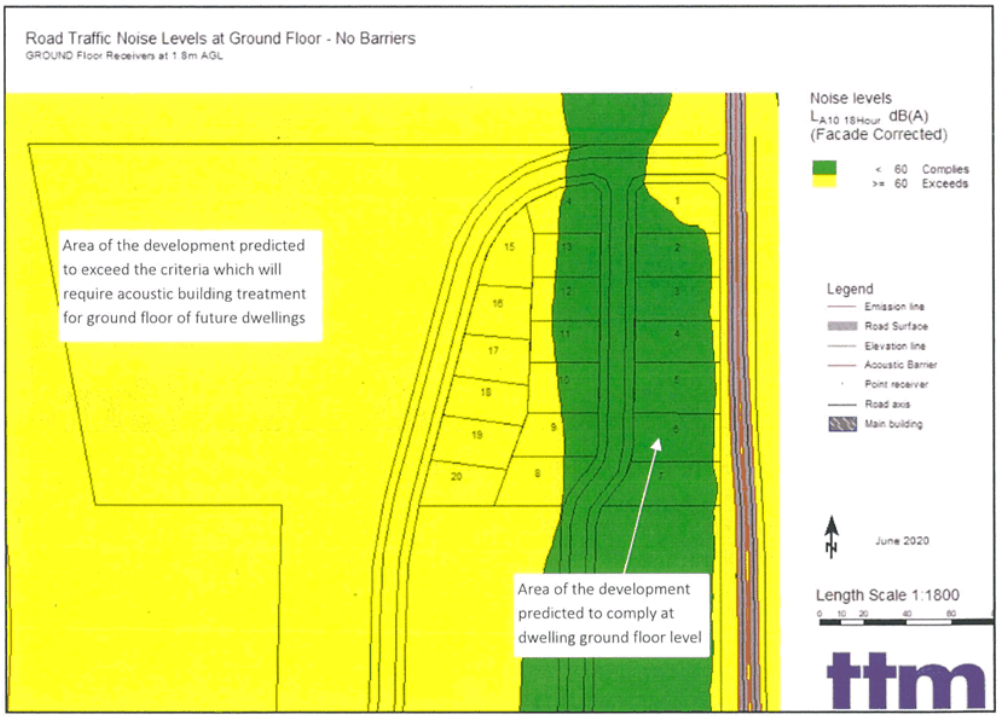
6.3.2 Dwelling Façade Assessment

Dwellings impacted by an external noise level equal to or less than 60 dB(A) $L_{10\,(18\ hour)}$ are predicted to comply with the internal noise requirements using standard non-acoustic building constructions with windows/doors closed. The noise contour results presented in the following sections are therefore compared to the derived façade corrected noise limit of 60 dB(A) $L_{10\,(18\ hour)}$.

Dwellings located in areas with a predicted external noise level greater than 60 dB(A) $L_{10\,(18\ hour)}$ will require further acoustic assessment to ensure that internal noise levels comply with the criteria of the *Development near Rail Corridors and Busy Roads*. This is in line with the methods of acoustic treatments previously accepted by Ballina Shire Council at Ballina Heights estate.

Figure 6 and Figure 7 below present the predicted road traffic noise levels at ground and first floor levels of dwellings respectively.

Figure 6: Predicted Ground Floor Road Traffic Noise Levels

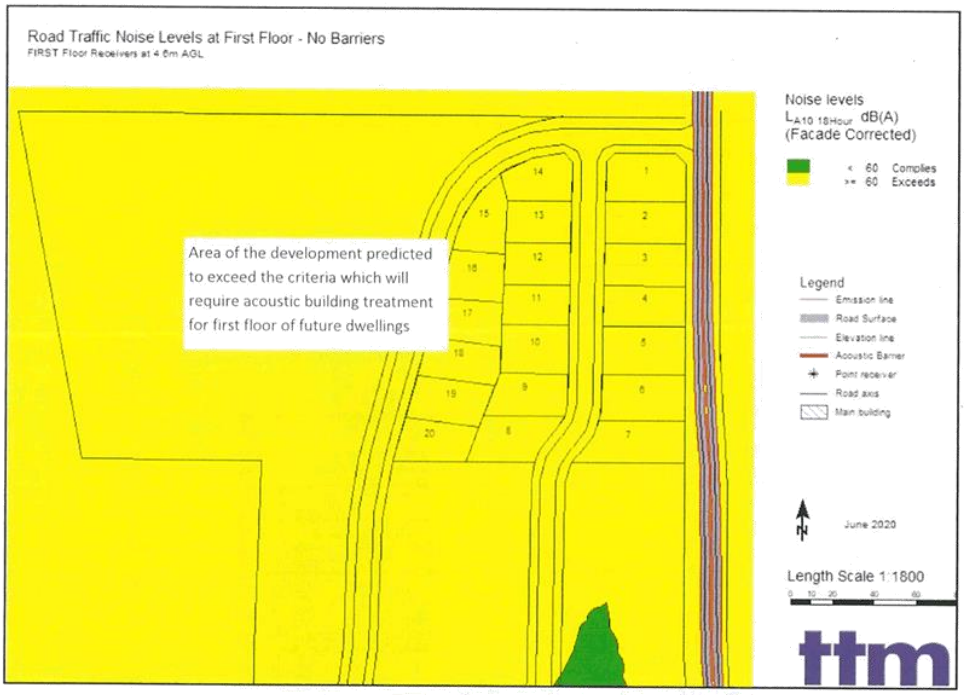


Road traffic noise levels at ground level are predicted to exceed the external noise criteria across approximately half of the development. Lots located in the noise affected areas (yellow shading) will require further acoustic assessment to ensure that indoor sound levels of dwellings comply with those prescribed in

Table 3.1 of *Development near Rail Corridors and Busy Roads – Interim Guideline*. With the exception of Lot 1, lots along the eastern boundary are deemed to be compliant with the criteria. Recommendations for acoustic treatment are detailed in Section 7.

The predicted road traffic noise levels at first floor of the development are presented in Figure 7.

Figure 7: Predicted First Floor Road Traffic Noise Levels



Road traffic noise levels are predicted to exceed the criteria at first floor level of the development. Therefore, the first floor level of noise affected lots would require further acoustic assessment to ensure that indoor sound levels of dwellings comply with the levels prescribed in Table 3.1 of *Development near Rail Corridors and Busy Roads – Interim Guideline*. Refer to the recommendations detailed in Section 7.

7 TTM Recommendations

Road traffic noise onto the development has been assessed. The following is recommended for predicted compliance with the noise criteria outlined in Section 5.

7.1 Road Traffic Noise

7.1.1 Private Outdoor Space

Modelling shows that road traffic noise levels are predicted to exceed the external criteria at lots on the western side of the development. However, given the orientation of future dwellings (garages and entry facing west) on Lots 15-20, outdoor recreation areas will be shielded by the building and are expected to comply. With the inclusion of a dwelling onsite, all lots are predicted to have an area of compliant outdoor space.

7.1.2 Acoustic Assessment of Noise Affected Lots

Section 6.3.2 of the report identifies the noise affected lots shown in yellow shading. It is recommended that dwellings on noise affected lots are designed to achieve the indoor sound levels recommended in NSW Department of Planning Document *Development near Rail Corridors and Busy Roads – Interim Guideline* (shown in Table 7).

Table 7: Internal Noise Limits from *Development near Rail Corridors and Busy Roads – Interim Guideline*

Table 3.1: Noise criteria		
Residential Buildings		
Type of occupancy	Noise Level dBA	Applicable time period
Sleeping areas (bedroom)	35	Night 10 pm to 7 am
Other habitable rooms (excl. garages, kitchens, bathrooms & hallways)	40	At any time

To determine the construction requirements for dwellings to achieve the internal noise criteria outlined Table 7, assessment of dwelling habitable spaces was undertaken in accordance with the procedures of Australian Standard AS3671:1989[2]. Traffic Noise Reduction (TNR) values at the site range between TNR 20 and TNR 30.

TNR values >10 ≤25 are nominated as Construction Category 2 in accordance with AS3671 which is defined as "standard construction, except for lightweight elements such as fibrous cement or metal cladding or all glass facades. Windows, doors and other openings must be closed". TNR values >25 ≤35 are nominated as Construction Category 3, which is defined as "special construction, chosen in accordance with Clause 3.4. Windows, doors and other openings must be closed".

[2] Australian Standard AS3671:1989 Acoustics – Road Traffic Noise Intrusion – Building Siting and Construction.

Subsequently it is recommended that lots with TNR values greater than 25 (i.e. Construction Category 3) undertake a site specific noise assessment to determine the building treatments required to achieve the indoor noise criteria. The specific lots with a TNR value greater than 25 are detailed in Table 8.

Table 8: Lots which require further acoustic assessment

Dwelling floor level	Lots Requiring a Site Specific Acoustic Assessment for the Specified Floor Level
Ground	1, 8 to 20
First	1 to 20

To achieve the internal noise criteria, windows and doors with line of sight to the Pacific Motorway and Ballina Heights Drive would need to be closed, and therefore provision of fresh air ventilation may be required. This could be achieved through the inclusion of air conditioning or through smart dwelling design by locating operable windows along non affected facades. An extract from *Development near Rail Corridors and Busy Roads – Interim Guideline* shown in Figure 8 below outlines the best practice dwelling layout to exclude road traffic noise at noise sensitive areas of a dwelling such as bedrooms, living areas and outdoor recreation areas.

Figure 8: Extract from *Development near Rail Corridors and Busy Roads – Interim Guideline*

Sleeping areas and other habitable areas should be placed on the side of the building furthest from the source of noise (road or rail line). Conversely rooms which are less sensitive (laundries, bathrooms, storage rooms, corridors, stairwells, etc.) should be placed on the noisy side of the building to act as a noise buffer. An additional way of minimising the intrusion of noise is to minimise the number of doors and windows (particularly windows that can be opened) on the noisy side of the dwelling.

Figures 3.5 and **3.6** provide examples of building layouts which place less sensitive service areas on noise affected facades. These arrangements provide effective shielding and distance to the more sensitive sleeping areas and other habitable areas.

More examples of noise sensitive layouts are illustrated in **Figures 3.7** and **3.8**. A series of solid walls and a room configuration that uses the garage to shield the house from noise and that locates bedrooms furthest from the noise source are important design elements to reduce adverse noise (see also Appendix B).

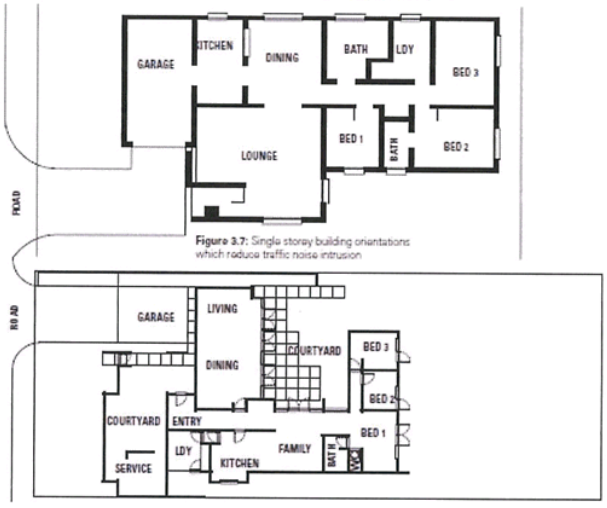


Figure 3.7: Single storey building orientations which reduce traffic noise intrusion

Figure 3.8: Double storey building orientation which reduces traffic noise intrusion

Building treatments will ultimately be dependent on the building design (i.e. the ratio of glazing compared to floor area, etc.) however based on the noise impact levels it is expected that treatments would not be too onerous on the lot purchaser.

Figure 3.3a of the Interim Guideline indicates that lots nearest to Ballina Heights Drive fall within the acoustic treatment Category 2, based on approximately 2,500 vehicles per day in 2030 and future dwellings being located approximately 10m from the nearest lane of the road. This is demonstrated in Figure 9 below.

Figure 9: Screen Test for Habitable Areas of Single/Dual Occupancy Dwellings

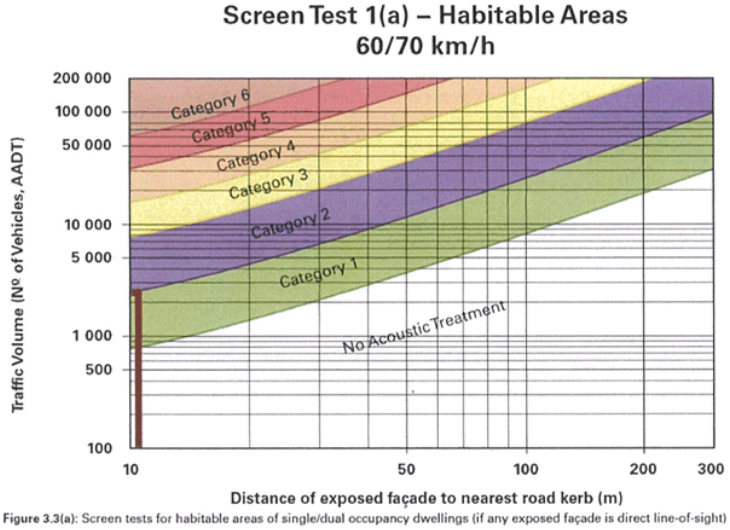


Figure 3.3(a): Screen tests for habitable areas of single/dual occupancy dwellings (if any exposed façade is direct line-of-sight)

Category 2 treatment is considered minor upgraded acoustic construction. An extract of the acoustic performance of building elements taken from Appendix C of the *Development near Rail Corridors and Busy Roads – Interim Guideline* is shown below.

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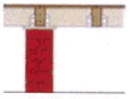
ACOUSTIC PERFORMANCE OF BUILDING ELEMENTS

The acoustic performances assumed of each building element in deriving the Standard Constructions for each category of noise control treatment presented in the preceding Table, are presented below in terms of Weighted Sound Reduction Index (Rw) values, which can be used to find alternatives to the standard constructions presented in this Appendix:

Category of Noise Control Treatment	R_w of Building Elements (minimum assumed)				
	Windows/Sliding Doors	Frontage Facade	Roof	Entry Door	Floor
Category 1	24	38	40	28	29
Category 2	27	45	43	30	29
Category 3	32	52	48	33	50
Category 4	35	55	52	33	50
Category 5	43	55	55	40	50

Category No.	Building Element	Standard Constructions	sample
2	Windows/Sliding Doors	Openable with minimum 6mm monolithic glass and full perimeter acoustic seals	
	Frontage Facade	**Timber Frame or Cladding Construction:** 6mm fibre cement sheeting or weatherboards or plank cladding externally, 90mm deep timber stud or 92mm metal stud, 13mm standard plasterboard internally with R2 insulation in wall cavity.	
		Brick Veneer Construction: 110mm brick, 90mm timber stud frame or 92mm metal stud, minimum 50mm clearance between masonry and stud frame, 10mm standard plasterboard internally.	
		Double Brick Cavity Construction: 2 leaves of 110mm brickwork separated by 50mm gap	
	Roof	Pitched concrete or terracotta tile or metal sheet roof with sarking, 10mm plasterboard ceiling fixed to ceiling joists, R2 insulation batts in roof cavity.	
	Entry Door	40mm solid core timber door fitted with full perimeter acoustic seals	
	Floor	1 layer of 19mm structural floor boards, timber joist on piers	
		Concrete slab floor on ground	

The Category 2 building treatments identified in Appendix C of the Interim Guideline provide an indicative guide for achieving predicted compliance with internal noise levels however they are not guaranteed to achieve compliance in all cases. Therefore, a site specific acoustic assessment of noise affected lots should be conducted by a suitably qualified acoustic consultant once building plans are available. The noise affected lots are those identified in Table 8.

8 Conclusion

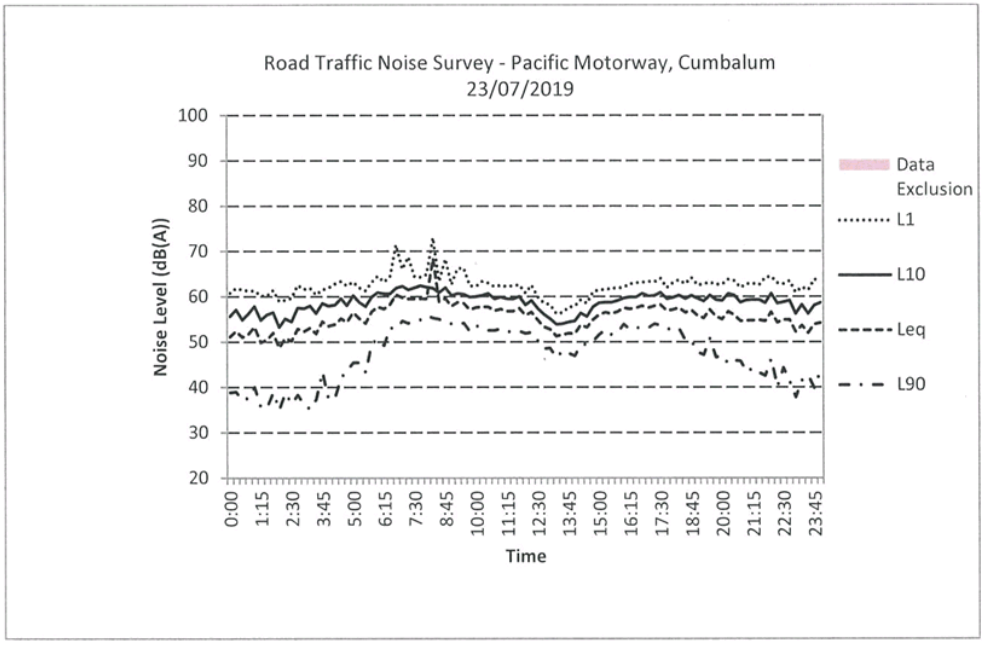
A road traffic noise assessment was undertaken of the proposed land rezoning for the northern part of Lot 1 DP1077982 Ballina Heights Drive, Cumbalum.

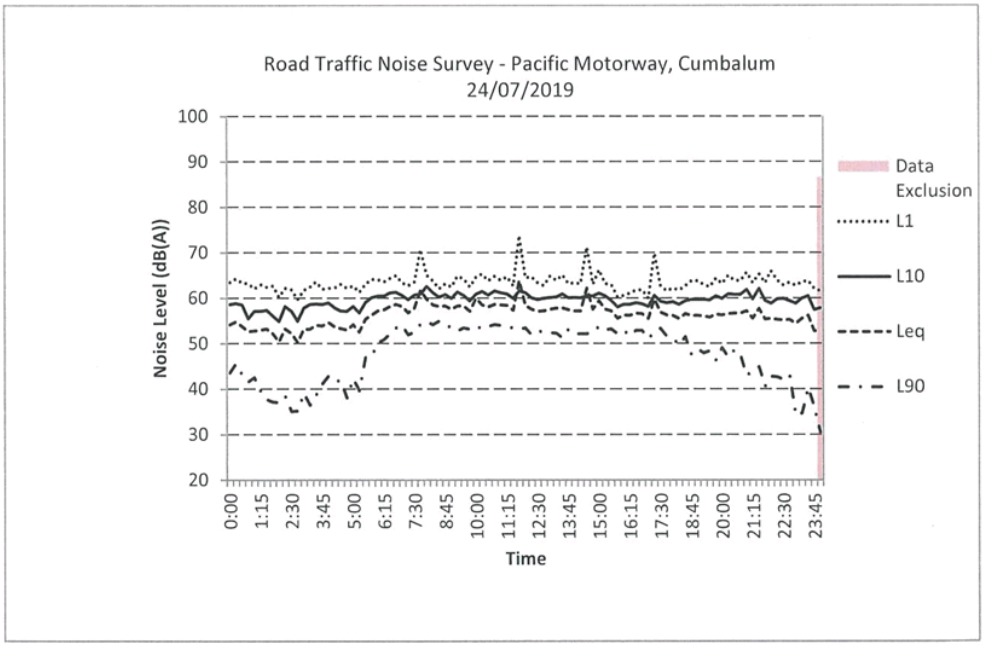
Road traffic noise levels were assessed at the development and were predicted to exceed the derived external noise criteria in some instances. Acoustic barriers on the western boundary were found to be generally ineffective at reducing road traffic noise levels across the site due to the undulating terrain. Once dwellings are constructed on the development, all lots are predicted to have an area of compliant outdoor space due to shielding provided by the building structure.

Noise affected lots were identified and a site-specific acoustic assessment is recommended for these lots once building plans are available.

Compliance with the criteria outlined in Section 5 is predicted to be achieved based on the implementation of the recommendations outlined in Section 7 of this report.

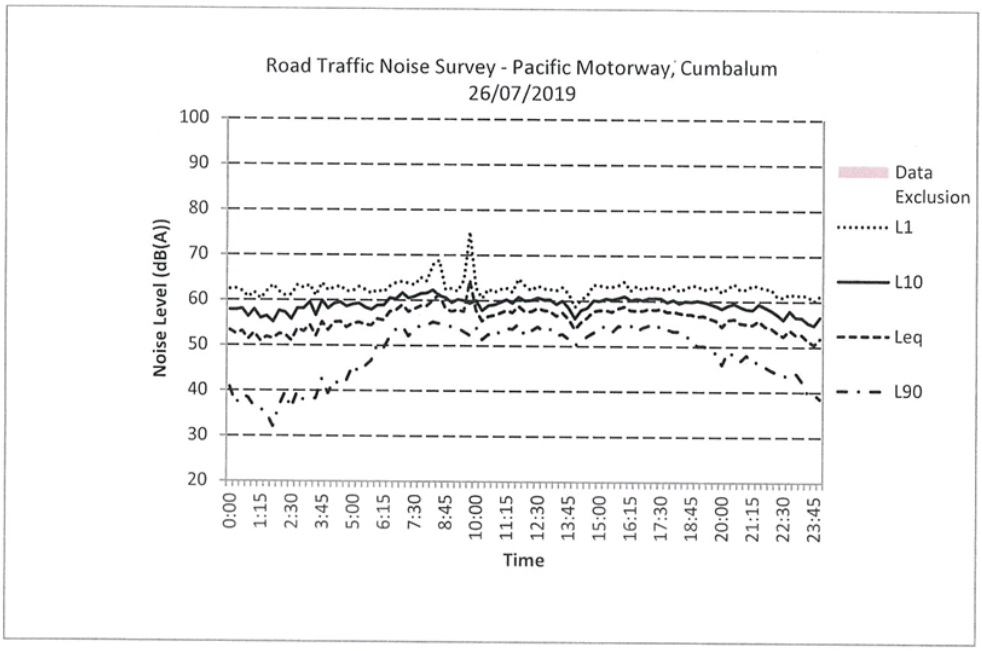
Appendix A Unattended Noise Monitoring Graphs

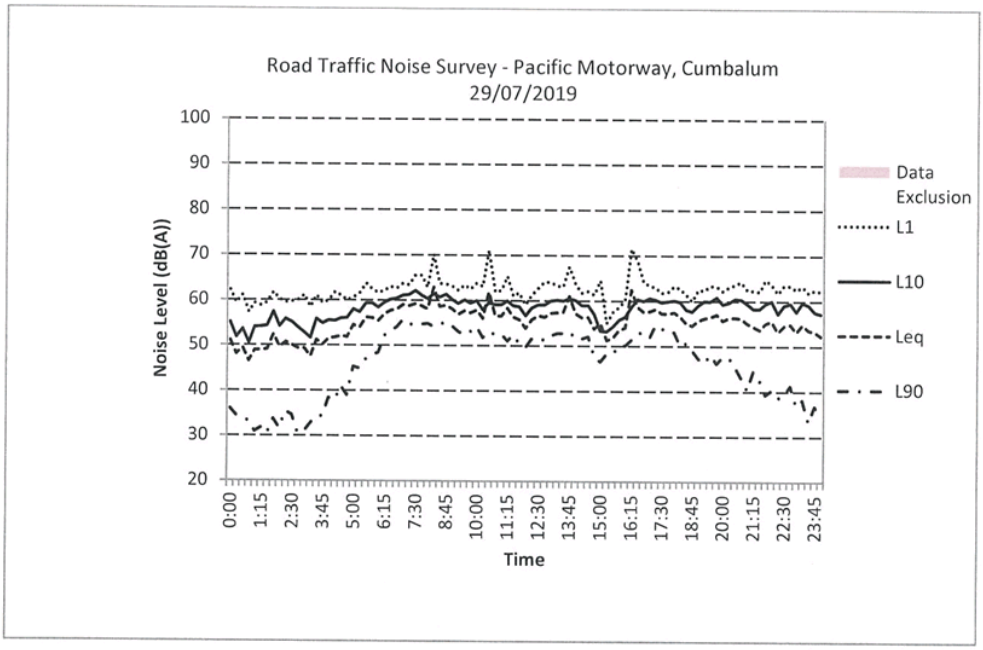




Site: Lot 1 DP1077982 Ballina Heights Drive, Cumbalum
Reference: 19GCA0089 R01_2

24


Road Traffic Noise Survey - Pacific Motorway, Cumbalum
26/07/2019
Noise Level (dB(A))
100
90
80
70
60
50
40
30
20
0:00
1:15
2:30
3:45
5:00
6:15
7:30
8:45
10:00
11:15
12:30
13:45
15:00
16:15
17:30
18:45
20:00
21:15
22:30
23:45
Time
Data Exclusion
L1
L10
Leq
L90


Road Traffic Noise Survey - Pacific Motorway, Cumbalum
29/07/2019
Noise Level (dB(A))
100
90
80
70
60
50
40
30
20
0:00
1:15
2:30
3:45
5:00
6:15
7:30
8:45
10:00
11:15
12:30
13:45
15:00
16:15
17:30
18:45
20:00
21:15
22:30
23:45
Time
Data Exclusion
L1
L10
Leq
L90

Appendix B Noise Modelling Outputs

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Ballina Heights Drive, Cumbalum
M13 - Rezoning North of Retirement Village - August 2019 - Verification

Receiver	Fl	Ground Height m	L10(18h) dB(A)
Logger	GF	48.98	60.1

TTM Consulting (Qld) Pty Ltd Level 1 - 129 Logan Rd Woolloongabba, QLD 4102

SoundPLAN 8.0

Site: Lot 1 DP1077982 Ballina Heights Drive, Cumbalum
Reference: 19GCA0089 R01_2