Planning Proposal – 36 River Road, Palmers Island

Planning Proposal

36 River Road, Palmers Island

Lot 27 DP 1130643

Amend Clarence Valley Local Environmental Plan 2011

July 2013

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This Planning Proposal has been prepared in accordance with the NSW Department of Planning document "A Guide to Preparing Planning Proposals" on behalf of the property owner Pridel Pty Ltd.

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Attached to this Planning Proposal are the following Annexure:

A Zoning Proposed and Existing Plan
B Details of the Existing Caravan Park
C Concept Park Design
D Development in Rural Zones DCP – Part Q Palmers Island River Bank Controls
E Detailed Site Investigations – Environmental & Earth Sciences
F Onsite Effluent Disposal Report, prepared by Holmes & Holmes Pty Ltd
G Flood Assessment, prepared by Paterson Consultants Pty Ltd
H Correspondence from the NSW Sugar Milling Co-Operative Limited

1. Introduction

This Planning Proposal is seeking to rezone a 1.63ha part of Lot 27 DP 1130643 from Zone RU1 Primary Production to Zone RU2 Rural Landscape and Zone E3 Environmental Management as shown illustrated on the Zoning Proposed and Existing Plan at **Annexure A**.

The rezoning is required to allow the Shady Nook Caravan Park to move outside of the Immediate Management Line which restricts development on land subject to riverbank erosion. The rezoning of a 1.63ha part of Lot 27 DP 1130643 from Zone RU1 Primary Production to Zone RU2 Rural Landscape will allow the proposed caravan park to locate outside of the Immediate Management Line. The rezoning will also allow the sensitive riparian area to be protected via an E3 Environmental Management Zone proposed in this planning proposal.

The existing caravan park (Details of the Existing Caravan Park attached at **Annexure B**) is presently located on the adjoining Lot 22 in DP 1122186 and Lot 7002 in DP 94908 collectively comprising about 1ha. The existing caravan park area is located within the Riverbank Erosion Area as shown on the Riverbank Erosion Planning Map (Sheet CL1_011I). Clause 7.6 Development on Land Subject to Riverbank Erosion from the Clarence Valley Local Environmental Plan 2011 prescribes;

(3) Development consent must not be granted to the carrying out of any development on land to which this clause applies unless the consent authority is satisfied that:

(a) the proposed development is not likely to adversely affect, or be adversely affected by, riverbank erosion, and

(b) the development is designed, sited and will be managed to avoid any adverse environmental impact from exposure to riverbank erosion or, if that impact cannot be avoided, after having taken into consideration feasible alternatives, the development is designed, sited and will be managed to minimise that impact or to mitigate that impact if that impact cannot be minimised, and

(c) there is no immediate threat to any building from riverbank erosion, and

(d) provision has been made for the relocation, modification or removal of the development if required as a result of a threat to the development from riverbank erosion

By rezoning a portion of the RU1 land to the east to RU2 the proposed caravan park can relocate east away from the Clarence River to ensure the park is located so *there is no immediate threat to any building from riverbank erosion* and plan for the possible long term adverse effects of riverbank erosion.

The planning proposal also seek to further protect the riparian land along the riverbank which is to be rezoned Zone E3 Environmental Management. The proposed rezoning is shown illustrated at **Annexure A – Zoning Proposed & Existing Plan.**

The rezoning will also allow for the upgrade of the rural caravan park and a new state of the art effluent disposal system. The disposal system will include providing a 2.5ha disposal field beyond the footprint proposed for rezoning achieving a separation between the field area and the riverbank. Such a field has not been previously provided for the park, this use is permissible under the RU1 zone presently applying to the land, so that rezoning of the proposed disposal area to RU2 Rural Landscape is not warranted. The new disposal system will facilitate intensification of the rural tourist use of the park to thereby offset some of the loss of tourist site capacity from elsewhere in the Lower Clarence region.

The new Zone E3 Environmental Management Zone will promote better management of the land on the riverside and river bank.

The application also seeks to retain the existing dwelling entitlement (i.e. belonging to Lot 27 in DP 1130643) via the subsequent boundary adjustment application for the residue agricultural allotment.

The area to be rezoned is show illustrated in **Annexure A – Zoning Proposed & Existing Plan.**

Once this LEP amendment has been approved & gazetted, a Development Application for the upgraded rural caravan park will be submitted to Council. Initial details of the upgraded park are attached at **Annexure C – Concept Park Design**.

The park has been designed in accordance with Local Government (Manufactured Home Estates, Caravan Parks, Camping Grounds and Moveable Dwellings) Regulation 2005.

The upgraded park will contain the following;

- 53 cabin sites,
- 92 tourist sites,
- 8 drive through sites,
- 11 visitor parking spaces,
- Toilet blocks,
- Effluent disposal areas,
- Common area of 4200m^2, and
- Vegetation buffers.

2. The Planning Proposal

2.1 Objectives or Intended Outcomes

The objectives of this Planning Proposal are: -

(a) To upgrade and adapt the Shady Nook Caravan Park as a contemporary rural caravan park facility in a manner that will complement the existing natural and constructed features of the area and will be of benefit to the area's economy.

Comment: The proposal involves shifting an existing caravan park onto adjacent land so that it is clear of the Riverbank Erosion Area identified by Clause 7.6 of the CLEP 2011, and therefore clear of the natural adverse processes of the Clarence River. The locality has a long history of activity in that it contained the original site of the Palmers Island School Public School before its conversion to the Shady Nook Caravan Park. The proposal is not out of character with the land uses that have been conducted in the locality.

The relocation of the caravan park will include combining it with an existing dwelling and machinery shed converted for facility management purposes. The relocation of the caravan park will otherwise occur on vacant land clear of other residences within Palmers Island Village. The proposal will present as a low-profile development, not dissimilar to that presently approved for the caravan park.

The proposal will allow an upgraded contemporary rural caravan park compliant with current provisions in the form of the Local Government (Manufactured Home Estates, Caravan Parks, Camping Grounds and Moveable Dwellings) Regulation 2005.

The proposal offers increased capacity to offset some of the significant loss of caravan park capacity from elsewhere in the Lower Clarence Region, and thereby protects the economic base gained from the region's tourist attractions. Furthermore, the proposal will offer increased capacity and thereby generate additional employment opportunities for the service industry.

(b) To provide a caravan park facility where it would not result in the degradation of environmental or agricultural features of the area.

Comment: The locality has a long history of activity in that it contained the original site of the Palmers Island Public School before its conversion to the Shady Nook Caravan Park. The proposal is not out of character with the land uses conducted in the locality.

The relocation of the caravan park will include combining it with an existing dwelling and machinery shed converted for facility management purposes. The relocation of the park will otherwise occur on vacant land clear of other residences within Palmers Island Village, and clear of existing agricultural activities. The proposal will present as a low-profile development, not dissimilar to that presently approved for the Shady Nook Caravan Park.

(c) To provide a caravan park facility in a location serviced by existing road services, physical service infrastructure, other tourist attractions, natural features and urban facilities.

Comment: The proposal will be located in the historic settlement of Palmers Island Village where road services, utility infrastructure and urban facilities have long been established which cater for both residents and tourists attracted by the natural appeal of the nearby Clarence River.

Furthermore, there is capacity in the location for the proposal to include installing a new state of the art effluent disposal system including establishing 2.5ha of land for disposal of treated effluent beyond the footprint proposed for rezoning. Such a field has not been previously provided for the park, and such use is permissible under the RU1 Primary Production Zone presently applying to the land, so that rezoning of the proposed disposal area to RU2 Rural Landscape is not warranted.

(d) To provide a caravan park facility that is supportive in scale of the region's prevailing tourism development,

Comment: The proposal will facilitate an increase in the caravan park's capacity from 48 sites under its present license to 145 sites. This will offset some of the loss of caravan park capacity from elsewhere in the Lower Clarence Region (e.g. Blue Dolphin Tourist Park, Yamba), and thereby will protect the economic base gained from the region's tourist attractions and accommodation. Furthermore, an increase in capacity will generate additional employment opportunities for the region's service industry.

(e) To protect environmentally sensitive coastal land,

Comment: The proposal includes the establishment of a E3 Environmental Management Zone over the riverside and river bank. This will encourage appropriate future use and management of this land which is likely to be adversely affected in the long and short term by, coastal processes and riverbank erosion.

It is considered the intended outcomes of the proposal are consistent with the objectives of the RU1 Primary Production, RU2 Rural Landscape and E3 Environmental Management Zones under the CLEP 2011.

2.2 Explanation of the Provisions

To achieve the objective above the following amendment to the Clarence Valley Local Environmental Plan 2011 is required.

Amendment of the Clarence Valley Local Environmental Plan 2011, Land Zoning Map – Sheet LZN_011I in accordance with the proposed zoning map shown at ***Annexure A.***

2.3 The Justification

The following justification sets out the case for changing the zones on the subject site to allow for the redevelopment of the Shady Nook Caravan Park.

2.3.1 (Section A) Is the planning proposal a result of any strategic study or report

The rezoning is required to allow the Shady Nook Caravan Park to continue to operate outside of the Immediate Management Line which restricts development on land subject to riverbank erosion. The rezoning of a 1.63ha part of Lot 27 DP 1130643 from Zone RU1 Primary Production to Zone RU2 Rural Landscape will allow the caravan park to locate outside of the Immediate Management Line. The rezoning will also allow the sensitive riparian area to be protected via an E3 Environmental Management Zone proposed in this planning proposal. While there is no specific strategic report recommending this site be rezoned for caravan park use, the Mid North Coast Regional Strategy does list a number of development objectives which support the planning proposal. These are covers in Section 2.3.1.5.

With regards increased capacity and improved amenity for the rural caravan park facility, the proposal is a response to various state government agency, federal agency and industry strategies

and reports which document the need for growth and improvement in this area and actively encourage caravan park type development on the North Coast of NSW. The Strategies are listed below;

- Towards 2020: New South Wales Tourism Masterplan (2002),
- Through the Looking Glass: The future of domestic tourism in Australia (2008),
- New South Wales Tourism Strategy (2008),
- The Mid North Coast Regional Strategy (MNCRS),
- Caravan and Camping Industry Association of NSW,
- RV Friendly Town Scheme, and
- Clarence River Way Masterplan

2.3.1.1 Clause 7.6 of the CLEP 2011

Clause 7.6 of the CLEP 2011 applies to the entire existing caravan park site. Clause 7.6 of the CLEP 2011 is reinforced specifically by Part P of Clarence Valley Council's Rural Zones DCP 2011, and was a consequence of the "Palmers Island Riverbank Plan" (PIRP - Maclean Shire Council, May 1995). The *Grafton and Lower Clarence Floodplain Risk Management Plan – Volume 1 Main Report* (Bewsher Consulting Pty Ltd, June 2007, report to Clarence Valley Council, p. 33) has summarized the circumstances of Clause 7.6 as follows:-

- properties situated on the western side of Palmers Island were identified as being troubled by river-bank erosion since at least the mid-1960s;
- attempts at rock protection had proved ineffective and expensive;
- the PIRP was prepared to target properties affected by an "Immediate Impact Zone";
- the affected properties, including the caravan park, were also targeted for voluntary purchase;
- **the State Government declined to fund purchase of the caravan park.**

The existing caravan park is presently located on adjoining Lot 22 in DP 1122186 and Lot 7002 in DP 94908 collectively comprising about 1ha. Almost half the existing caravan park is located within the immediate management precinct applied by Clause P5 Controls for Precinct 1 in the Rural Zones DCP, which prescribes a no buildings requirement. The remainder of the park is located within the 100 year management precinct applied by Clause P6 Controls for Precinct 2 in the Rural Zones DCP.

The existing caravan park is to relocate east away from the Clarence River to ensure all the sites are located out of the immediate management precinct, and plan for possible long term adverse riverbank erosion effects affecting the 100 year management precinct component. To achieve this, the land east of the park is to be rezoned from RU1 Primary Production to RU2 Rural Landscape.

The following is an assessment of the relevant controls from Part P Palmers Island River Bank Controls of the Rural Zones DCP 2011. Part P is attached at **Annexure D.**

> ***P6.1.*** *Development within this Precinct 2 will be considered on the understanding that any consent granted will be subject to the provision that should the riverbank come within 18 metres of any building then the development consent will cease.*
>
> Comment: This is understood by the applicant.

P6.2. *If the development consent does cease then the owner of the land will be responsible for the removal of any or all buildings from the site at the owner's expense, or where possible, to a location on the site further than 18 metres from the riverbank.*

Comment: This is understood by the applicant.

P6.3. *Prior to lodging an application with Council, the developer of the land must determine whether buildings are to be relocated or demolished, should the consent cease.*

Comment: Noted

P6.4. *Notwithstanding the above, all Class 1 residential buildings (dwelling-houses) must be relocatable and able to meet the conditions listed below. Extensions to existing dwellings may also be required to be demountable, taking into consideration the additional floor space proposed and the likely effect of the extension on the ability of the building to be relocated in case of an emergency.*

Comment: No dwelling houses are proposed as part of the park. However the existing dwelling on site will be used as the managers residence for the proposed caravan park. Extensions to the existing dwelling will comply with this requirement.

The following conditions will be imposed due to the possibility of riverbank erosion adversely affecting dwellings within the next 100 years.
1. The dwelling-house will be designed and constructed so that it can be easily removed from the site by road vehicle. The plans of the building will include an adequate description of the removal process.

Comment: No dwelling houses will be proposed as part of the caravan park, however the cabins within Precinct 2 will be constructed to be easily removed form the site by road vehicle.

2. Further to subclause (1), at the time of submission of a building application, a certificate is to be provided from a practicing structural engineer as to the adequacy of this building to be easily dismounted and readily removed from the site by road vehicle.

Comment: Noted.

3. The dwelling shall be located so as to maximise as far as practicable the distance from the nearest point of the building to the riverside boundary of the site with due consideration given to subclause (a) above and to any relevant local government building regulations.

Comment: The major appeal for this rural caravan park is its proximity to the Clarence River. With this in mind the design of the park has taken both the benefit from the river and also the risk from river bank erosion into account when designing the park layout. The cabin sites are located in an area which allows easy removal as they have direct access to River Road. This is a suitable balance between safety from river bank erosion and orderly and economic development of the site.

4. Subsequent to any approval being given for a relocatable dwelling, no works shall be carried out on the property which might hinder the ready relocation of the building. Such works might include the construction of wall, fences, screens, enclosures, brick veneering, landscaping or the fixing of joints or structural members by welding or other means.

Comment: A road network is included as part of the caravan park proposal, this will ensure vehicle access to all built structures are maintained and can be removed easily. Garden beds will be proposed as part of the caravan park but these will not present any barrier to relocated built elements if required by river bank erosion.

5. A restriction as to user will be placed on the title pursuant to the provision of section 88B of the Conveyancing Act 1919, stating: The subject land and any improvements erected thereon shall not be used for the purpose of (land use) in the event that the riverbank, as defined by Maclean Shire Council from time to time, comes to within 18 metres of any building or any part thereof at any time erected on the said land.

Comment: Noted and accepted by the Applicant.

6. This development consent shall cease if at any time the riverbank, as defined by Council comes to within 18 metres of any building associated with this development. The buildings shall then be removed by the owner of the land at the owner's expense.

Comment: Noted and accepted by the Applicant.

As shown above, the proposed rural caravan park can easily comply with the Clarence Valley Council Rural Zones DCP 2011 Part P Palmers Island Riverbank Controls and the Palmers Island Riverbank Management Plan 1995.

While the Planning Proposal is seeking a rezoning to allow built works within Precinct 2 (100 Year Management Line) adequate design elements and building styles can be employed to ensure all buildings can be easily be relocated in the event of erosion threatening the park in the next 100 years.

2.3.1.2 Towards 2020: New South Wales Tourism Masterplan (2002)

This state agency Masterplan (Tourism NSW 2002) presented an immediate 3-year strategy towards a 20 year vision for tourism in NSW, and built on the framework devised by previous masterplans formulated in 1995 and 1998. The Masterplan anticipated the annual growth rates of "visitors" in NSW to outstrip those of "resident population", thereby increasing pressure on the demand for goods' services and infrastructure by non-residents at state, regional and local levels.

The Masterplan noted: -

- "visitors" were attaching increasing importance to quality destination experiences;
- the need for facilities that provide authentic and affordable products and services to generate return visits and recommendations;
- the need for increased private investment into the tourism sector to improve accommodation, attractions and tour operations.

Comment: The planning proposal allows for a rural caravan park which is privately funded and will provide the quality and affordable tourist accommodation the Towards 2020 NSW Tourism Masterplan has identified is required.

2.3.1.3 Through the Looking Glass: The future of domestic tourism in Australia (2008)

This document (Tourism Research Australia 2008) was the final stage (Stage 3) of a federal agency investigation into the domestic tourism market. The key findings of Stage 1 (*"An assessment of the Australian domestic tourism market"* 2006) was that domestic tourism's share of household consumption had declined over the previous 20 years, whilst spending on outbound tourism had increased. Stage 2 (*"Changing consumer behaviour: Impact on the Australian domestic tourism market"* 2007) analysed consumer attitudes and behaviours towards domestic tourism. This final stage document investigated the current and emerging issues that would affect future domestic tourism consumption.

The issues identified by consumers included Australia's shortage of affordable accommodation to cater for domestic tourism, except at the luxury end of the rate scale. Consumers otherwise identified the accommodation that was available as "neutral and characterless".

The document forecast a national decline in domestic consumption of caravan and camping accommodation for the period 2006 to 2011 by 1.1% annually to 39 million visitor nights. However, provided affordable and suitable caravan and camping accommodation is supplied, the document anticipates a national increase in consumption for the period 2011 to 2020 by 1.5% annually to 45 million visitor nights.

Comment: The planning proposal allows for a rural caravan park which will fill the void in the affordability market as outlined in this report. The park will provide affordable accommodation aimed at the domestic market, thus catering for the predicted increase in demand for this type of tourist accommodation by 2020.

2.3.1.4 New South Wales Tourism Strategy (2008)

This state agency strategy (Tourism NSW Nov. 2008) responded to the O'Neill *"Review into Tourism in New south Wales"* (May 2008), and recognized the need to update the *Towards 2020: New South Wales Tourism Masterplan* (2002).

The strategy identifies the following as additional key areas for regional tourism: -

- promotion of regional partnerships; and
- supply, by government – industry collaboration, of sufficient tour-related infrastructure and services to satisfy increased demand.

The implications of strategy are: -

- strengthened governance arrangements for domestic tourism and related industries;
- increased domestic tourism for regional NSW;
- a new focus on supply side issues including enhancements to aviation, national parks, infrastructure and education.

The strategy anticipates a growth in domestic tourism consumption for the period to 2016 by 2.2% annually.

2.3.1.5 Mid North Coast Regional Strategy (2009)

This state agency strategy (i.e. MNCRS) emphasizes *"the need to ensure that the character and appeal of coastal towns, villages and their hinterland, which are drawcards for visitors, is not lost"* (p.8) in order to protect tourism as a significant component of the regional economy. The Mid North Coast region receives about 5.4 million visitors per year who collectively spend about $1.4 billion. The MNCRS estimates that tourism employs more than 7000 people in the region.

The existing caravan park is located within the "Coastal Area" shown on the Strategy map, so that the Sustainability Criteria provisions do not apply (as per MNCRS p.45). Regardless, the Strategy map identifies Palmers Island Village as a "Growth Area". Furthermore, the locality has long been serviced by road and utility infrastructure, except reticulated sewer.

The tourism development objectives of the MNCRS include: -

- *offering a range of tourism experiences and forms of tourist accommodation in urban areas.*

  Comment: The proposal will facilitate an increase in the caravan park's capacity from 48 sites under its present license to 145 sites, immediately adjacent to the historic settlement of Palmers Island Village. This will offset some of the anticipated loss of tourist site capacity from elsewhere in the Lower Clarence region (e.g. Blue Dolphin Tourist Park, Yamba), and thereby will protect the economic base gained from the region's tourist attractions. Furthermore, an increase in capacity will generate additional employment opportunities for the region's service industry. Therefore, the proposal is consistent with this objective in that it will offer a form of tourist accommodation that is otherwise diminishing in the region.

- *locating development away from the Pacific Highway.*

  Comment: The proposal will be located about 5.7km east of the Pacific Highway, approximately midway between the highway and Yamba. Therefore, the proposal is consistent with this objective in that it will be located away from the Pacific Highway.

The Environmental & Natural Resources actions of the MNCRS include: -

- *Local environmental plans will protect and zone land with high environmental, vegetation, habitat, riparian, aquatic, coastal or corridor values for environmental protection.*

  Comment: All Riparian land has been included in the proposed E3 Environmental Management zone.

- *Local environmental plans will include provisions to encourage habitat and corridor establishment in future zoning of land with environmental and rural values.*

  Comment: Relevant provisions are included under the E3 Environmental Management zone clauses of the CLEP 2011.

- *Regionally significant farmland will not be available for future urban or rural residential rezoning other than in the limited circumstances as permitted by the Mid North Coast Farmland Mapping Project Final Recommendations Report (2008).*

  Comment: The recommendations in the Mid North Coast Farmland Mapping Project Final Recommendations Report, recommend lands identified a Regionally Significant Farmland not be rezoned to Urban or Rural Residential uses. The proposal is seeking to rezone the site from Zone RU1 Primary Production to Zone RU2 Rural Landscape and Zone E3 Environmental Management.

- *Mapped farmland will be protected from the impacts of new neighbouring development through conflict risk assessment and buffers, consistent with the Mid North Coast Farmland Mapping Project and the Rural Lands State Environmental Planning Policy.*

  Comment: The location of the rural caravan park and tea tree plantation will separate the historic Village of Palmers Island and the neighbouring farming uses to the south and

east (partial). Land use conflict from farming uses has been an issue in this Region in the past, a rural caravan park can minimise any land use conflict from the farming uses.

The Mid North Coast Farmland Mapping Project report states *development should not be located in areas where there is an identified risk of land use conflict near an existing agricultural enterprise,* and *buffers must be incorporated to separate potential agricultural and residential uses.* This planning proposal is seeking to maintain the rural zoning by proposing a RU2 Rural Landscape Zone and not proposing urban or residential land uses. Currently there is an immediate interface between the residential township of Palmers Island and farming uses. This planning proposal seeks to allow a rural caravan park to be constructed between the farming uses and the residential township of Palmers Island. The RU2 zone and operation of a rural caravan park will provide land use separation between the farmland and sensitive residential receivers (Palmers Island village) in accordance with the recommendations of the Farmland Mapping Project.

2.3.1.6 Caravan and Camping Industry Association of New South Wales

The CCIA represents the NSW membership of some 560 owners and operators of tourist parks, manufactured home villages and estates, manufacturers of manufactured homes, caravans, motorhomes, retailers of manufactured homes, recreational vehicles, camping equipment and accessories, and the service industries.

The CCIA, in its media releases, has reported: -

- Coastal NSW experienced a 10% growth in caravan and camping tourism consumption during the 2008/2009 summer. It noted new campers had entered the market, and there was a corresponding increase in cabin accommodation bookings;
- The NSW Mid North Coast and NSW Northern Rivers regions are identified as being in the top three (3) Australian destinations of preference for caravan and camping holidays (i.e. 4.2 million visitor nights for the period March 2008 to March 2009 – cited from 2008 Snapshot released by Tourism Research Australia 2008);
- Holiday parks are now destinations in themselves by offering holiday activities, resort-style swimming pools, and clean and quality facilities in strategic locations; and
- Caravan and camping tourism has been the fastest-growing tourism sector in Australia, and is tipped to boost the slump in domestic tourism into the future (cited from *"Through the Looking Glass: The future of domestic tourism in Australia"* - Tourism Research Australia 2008).

Comment: As outlined above the Region of the Mid North Coast is an area of with high demand for affordable accommodation within the tourism market. With the caravan and camping style tourism being the fastest growing sector in Australia. The planning proposal allows for a park which can cater for this demand.

2.3.1.7 RV Friendly Town Scheme

The 'RV Friendly Town™ scheme is an initiative of the Campervan and Motorhome Club of Australia (CMCA) that promotes RV tourism related services across Australia. By promoting the partnership between the RV tourist and small towns, the scheme encourage expansion of tourism related infrastructure and services and promotes the economic advantage to small towns of providing RV tourist specific amenities.

Essential criteria for a town to qualify as RV Friendly:

- Provision of appropriate parking within the town centre, including access to a general shopping area with groceries or fresh produce,
- Provision of short term (24/48 hour) parking for self-contained vehicles, no more than 5km from the post office or agency,
- Access to potable water, and
- Access to a free dump point within the town precinct.

Desirable criteria for a town to qualify as RV Friendly:

- Provision of long term parking for self-contained vehicles,
- Access to medical facilities or an applicable evacuation plan,
- Access to a pharmacy or a procedure to obtain pharmaceutical products,
- Visitor Information Centre (VIC) with appropriate parking facilities within a reasonable distance,
- VIC to provide a town map showing essential facilities such as hospital, medical services, fuel, shopping area, dump point, fresh water, etc, and
- RV Friendly Town™ signs to be erected within the town precinct.

Comment: In the recent Council meeting of 19 March 2013 Council unanimously voted to support the RV Friendly Towns Scheme and to seek RV Friendly Status for the Clarence Valley Towns, including Maclean, Yamba, Ulmarra and Lawrence.

Council voted to:

1. Endorse the strategic identified actions to be applied to Clarence Valley towns requesting RV Friendly status:
   a) RV Friendly status be supported for its contribution to the local tourism infrastructure and local economy.
   b) Provision of RV Friendly sites by the private sector is preferred.
   c) Where the private sector is demonstrably unable or unwilling to provide RV Friendly sites, Council will support establishment on public land, preferably managed and provided by a separate entity.
   d) Council will only manage RV Friendly sites where items b) and c) cannot be implemented.
   e) Council's support for RV Friendly status will require business and community support.

This planning proposal is seeking to rezone a small portion of land to allow of a rural caravan park suitable to service RV's (**Refer to Annexure C Concept Park Design**). This park will be developed and operated by the private sector in accordance with Councils resolution to achieve RV Friendly Status for Towns within the Clarence Valley.

2.3.1.8 Clarence River Way Masterplan

The Clarence River Way Masterplan is an integrated, market driven, destination development initiative that sets out new development and infrastructure goals for the Clarence Valley Region, establishes a single vision, aims to re-focus resources to achieve maximum economic and community outcomes and seeks to position the Clarence as one of the nation's great river experiences.

During the research phases of the Masterplan results indicated the Clarence should focus on attracting two key emerging target markets being, Experience Seeker and Local/regional community. Preliminary market research undertaken for the masterplan indicates that the Clarence Valley currently attracts two key markets, Touring traveller (Wanderers) and Family traveller (Compatriots). The Clarence River Way seeks to consolidate and increase market share and yield in these existing markets.

The Strategic Intent of the masterplan seeks to build upon the strong assets between Grafton and Yamba and develop a series of tourist hubs supporting land and river based activity. To achieve this,

the masterplan recommends a number of options. Specific to townships located on the Clarence River, the masterplan outlines opportunities to provide a range of land/water interface access points along the river allied to the main townships and tourist between Yamba and Grafton, develop a network of river based hubs that integrate land based attractions with river front access and develop pedestrian linkages and access to the water.

Comment: This planning proposal seek to rezone land to allow the upgrade and relocation of an existing rural caravan park on the river, which is inline with the opportunities outlines in the Clarence River Way Masterplan.

The Clarence River Way Masterplan lists three implementation priorities which will see the aims of the masterplan accomplished.

Priority 1 – Planning, Management and Coordination

The first priority is management, to both co-ordinate and facilitate development of the Clarence River Way and implement the masterplan.

Comment: This planning proposal seek to rezone land to allow the upgrade and relocation of an existing rural caravan park on the river, which is inline with the first priority of this masterplan.

Priority 2 – Infrastructure, Access and Training

In order to build the destination, investment is required in infrastructure to provide the catalyst for private development / entrepreneur investment. This includes river-based assets and physical construction such as boardwalks, jetties, launching areas and places to see the water. Allied to this is investment in training for the tourism industry to meet target market expectation. Infrastructure works should be prioritised starting at the river / land interface followed by works beyond the river.

Comment: This planning proposal seek to rezone land to allow the upgrade and relocation of an existing rural caravan park on the river. This will be achieved through private capital and operate as a local business. Upgrade to the river infrastructure and improvements to the riparian areas onsite as also proposed which is inline with the second priority of this masterplan.

2.3.2 Is the planning proposal the best means of achieving the objectives or intended outcomes, or is there a better way

Yes, by zoning part of Lot 27 in DP 1130643 RU2 Rural Landscape it will allow the park to move east outside of the Immediate Management Line and also retain potential rural and agricultural uses for the land. The rezoning also allows the riparian areas on site and all land within the immediate management line to be zoned E3 Environmental Management further protecting this sensitive area of the site.

2.3.3 (Section B) Is the planning proposal consistent with the objectives and actions contained within the applicable regional or sub-regional strategy

2.3.3.1 Mid North Coast Regional Strategy

The primary purpose of the Strategy (i.e. MNCRS) is to ensure that adequate land is available and appropriately located to accommodate the projected housing and employment needs of the Region's population over the next 25 years.

This state agency strategy emphasizes "*the need to ensure that the character and appeal of coastal towns, villages and their hinterland, which are drawcards for visitors, is not lost*" (p.8) in order to protect tourism as a significant component of the regional economy. The Mid North Coast region

receives about 5.4 million visitors per year who collectively spend about $1.4 billion. The MNCRS estimates that tourism employs more than 7000 people in the region.

The existing caravan park is located within the "Coastal Area" shown on the Strategy map, so that the Sustainability Criteria provisions do not apply (as per MNCRS p.45). Regardless, the Strategy map identifies Palmers Island Village as a "Growth Area". Furthermore, the locality has long been serviced by road and utility infrastructure, except reticulated sewer.

The tourism development objectives of the MNCRS include: -

- *offering a range of tourism experiences and forms of tourist accommodation in urban areas.*

  Comment: The proposal will facilitate an increase in the caravan park's capacity from 48 sites under its present license to 145 sites, immediately adjacent to the historic settlement of Palmers Island Village. This will offset some of the anticipated loss of tourist site capacity from elsewhere in the Lower Clarence region (e.g. Blue Dolphin Tourist Park, Yamba), and thereby will protect the economic base gained from the region's tourist attractions. Furthermore, an increase in capacity will generate additional employment opportunities for the region's service industry. Therefore, the proposal is consistent with this objective in that it will offer a form of tourist accommodation that is otherwise diminishing in the region.

- *locating development away from the Pacific Highway.*

  Comment: The proposal will be located about 5.7km east of the Pacific Highway, approximately midway between the highway and Yamba. Therefore, the proposal is consistent with this objective in that it will be located away from the Pacific Highway.

The Environmental & Natural Resources actions of the MNCRS include: -

- *Local environmental plans will protect and zone land with high environmental, vegetation, habitat, riparian, aquatic, coastal or corridor values for environmental protection.*

  Comment: All Riparian land has been included in the proposed E3 Environmental Management Zone.

- *Local environmental plans will include provisions to encourage habitat and corridor establishment in future zoning of land with environmental and rural values.*

  Comment: Relevant provisions are included under the E3 Environmental Management Zone clauses of the CLEP 2011.

- *Regionally significant farmland will not be available for future urban or rural residential rezoning other than in the limited circumstances as permitted by the Mid North Coast Farmland Mapping Project Final Recommendations Report (2008).*

  Comment: The recommendations in the Mid North Coast Farmland Mapping Project Final Recommendations Report, recommend lands identified a Regionally Significant Farmland not be rezoned to Urban or Rural Residential uses. The proposal is seeking to rezone the site from Zone RU1 Primary Production to Zone RU2 Rural Landscape and Zone E3 Environmental Management not Urban or Rural Residential uses.

- *Mapped farmland will be protected from the impacts of new neighbouring development through conflict risk assessment and buffers, consistent with the Mid North Coast Farmland Mapping Project and the Rural Lands State Environmental Planning Policy.*

Comment: The location of the rural caravan park and tea tree plantation will separate the historic Village of Palmers Island and the neighbouring farming uses to the south and east (partial). Land use conflict from farming uses has been an issue in this Region in the past, a rural caravan park can minimise any land use conflict from the farming uses.

The Mid North Coast Farmland Mapping Project report states *development should not be located in areas where there is an identified risk of land use conflict near an existing agricultural enterprise,* and *buffers must be incorporated to separate potential agricultural and residential uses.* This planning proposal is seeking to maintain the rural zoning by proposing a RU2 Rural Landscape Zone and not proposing urban or residential land uses. Currently there is an immediate interface between the residential township of Palmers Island and farming uses. This planning proposal seeks to allow a rural caravan park to be constructed between the farming uses and the residential township of Palmers Island. The RU2 zone and operation of a rural caravan park will provide land use separation between the farmland and sensitive residential receivers (Palmers Island village) in accordance with the recommendations of the Farmland Mapping Project.

The Rural Lands SEPP is addressed in Section **2.3.5.2.**

The planning proposal and its outcomes are consistent with the objectives and actions of the Mid North Coast Regional Strategy.

2.3.3.2 New South Wales Tourism Strategy 2008

This state agency strategy (Tourism NSW Nov. 2008) responded to the O'Neill "*Review into Tourism in New south Wales*" (May 2008), and recognized the need to update the *Towards 2020: New South Wales Tourism Masterplan* (2002).

The strategy identifies the following as additional key areas for regional tourism: -

- promotion of regional partnerships; and
- supply, by government – industry collaboration, of sufficient tour-related infrastructure and services to satisfy increased demand.

The implications of strategy are: -

- strengthened governance arrangements for domestic tourism and related industries;
- increased domestic tourism for regional NSW;
- a new focus on supply side issues including enhancements to aviation, national parks, infrastructure and education.

The strategy anticipates a growth in domestic tourism consumption for the period to 2016 by 2.2% annually.

The planning proposal and its outcomes are consistent with the objectives and actions of the New South Wales Tourism Strategy 2008.

2.3.4 Is the planning proposal consistent with the local council's local strategy, or other local strategic plan

The Clarence Valley Council produced the Clarence Valley Settlement Strategy in March 1999, a makes references to small river villages like Palmers Island.

- *Will aim to maximise access to existing community infrastructure by locating and orienting new development close to the existing village 'heart' area;*

Comment The proposed Caravan Park will be adjacent to the Palmers Island Village, south of Yamba Road.

- *Will aim to preserve special village character or heritage significance by asking the community to identify distinctive lifestyle or landscape elements, and by encouraging compatible design in new development; and*

Comment The proposal will undertake significant public consultation in both the Planning Proposal and Development Application stages giving the community ample opportunity to comment on the proposal.

- *Will aim to fulfil any potential for low-key tourism associated with natural, built, or cultural attributes.*

Comment As outlined above the proposed rural caravan park is replacing an existing park and is being expanded as a result of the increased tourism of the area. The natural attributes of the site will also be protected in an E3 Environmental Management Zone.

- *Valley Vision 2020 is the first Corporate Strategic Plan for the Clarence Valley Council. Valley Vision 2020 is to provide long-term strategic direction and integrated action for CVC. This document promotes natural attractions and values of the Clarence Valley Local Government Area.*

Comment The Planning Proposal aims to facilitate 'access' to those values by providing rural accommodation in the form of a caravan park while also maintaining and protecting the riparian areas with an Environmental Management Zone.

2.3.5 Is the planning proposal consistent with applicable State Environmental Planning Policies

The relevant State Environmental Planning Policies (SEPP's) are referred to below;

2.3.5.1 State Environmental Planning Policy No 21—Caravan Parks.

The aim of this Policy is to encourage:

(a) the orderly and economic use and development of land used or intended to be used as a caravan park catering exclusively or predominantly for short-term residents (such as tourists) or for long-term residents, or catering for both, and

(b) the proper management and development of land so used, for the purpose of promoting the social and economic welfare of the community, and

(c) the provision of community facilities for land so used, and

(d) the protection of the environment of, and in the vicinity of, land so used.

A Council may grant a development consent required by this Policy only after it has considered the following, a response to each principle is provided below.

(a) whether, because of its location or character, the land concerned is particularly suitable for use as a caravan park for tourists or for long-term residence,

A caravan park has operated on this location previously. The land is suitable for use as a rural caravan park. The risk of flooding will be mitigated by the design of the park and employment of a Site Specific Flood Evacuation Plan to ensure the safe evacuation of persons in the event of a flood. A Flood Assessment is attached at **Annexure G**.

Permanent residences are not proposed at this park.

(b) whether there is adequate provision for tourist accommodation in the locality of that land, and whether existing or potential tourist accommodation will be displaced by the use of sites for long-term residence,

There is a need for more caravan parks in the Mid North Coast as many have been closing down in the last 5 years.

(c) whether there is adequate low-cost housing, or land available for low-cost housing, in that locality,

There has been a number of State, Regional and National Strategies prepared that document the need for more low to medium cost tourist accommodation, particularly within the Mid North Coast. These documents are referred to above in Section 2.3.1 and outline the need for more quality tourism accommodation.

(d) whether necessary community facilities and services are available within the caravan park to which the development application relates or in the locality (or both), and whether those facilities and services are reasonably accessible to the occupants of the caravan park,

Adequate services are proposed as part of the rural caravan park. Services are also provided in the nearby towns of Maclean and Yamba.

(e) any relevant guidelines issued by the Director, and

None as yet.

(f) the provisions of the Local Government (Caravan Parks and Camping Grounds) Transitional Regulation 1993.

This Regulation has been repealed and replaced with Local Government (Manufactured Home Estates, Caravan Parks, Camping Grounds and Moveable Dwellings) Regulation 2005. The proposed caravan park has been designed to and complies with the provisions of this Local Government Regulation.

2.3.5.2 State Environmental Planning Policy (Rural Lands) 2008

The aims of this Policy are as follows:

(a) to facilitate the orderly and economic use and development of rural lands for rural and related purposes,

(b) to identify the Rural Planning Principles and the Rural Subdivision Principles so as to assist in the proper management, development and protection of rural lands for the purpose of promoting the social, economic and environmental welfare of the State,

(c) to implement measures designed to reduce land use conflicts,

(d) to identify State significant agricultural land for the purpose of ensuring the ongoing viability of agriculture on that land, having regard to social, economic and environmental considerations,

(e) to amend provisions of other environmental planning instruments relating to concessional lots in rural subdivisions.

The Rural Planning Principles are as follows, a comment on each is provided below.

(a) the promotion and protection of opportunities for current and potential productive and sustainable economic activities in rural areas,

Comment: The proposed zoning (RU2 Rural Landscape) will retain the rural uses onsite except for the Riparian Area which is to become an Environmental Management Zone (E3). The RU2 zoning will promote and protect opportunities for sustainable economic activities in the rural area of Palmers Island as required by this Principle.

(b) recognition of the importance of rural lands and agriculture and the changing nature of agriculture and of trends, demands and issues in agriculture in the area, region or State,

Comment: The planning proposal recognizes the changing nature of agriculture practices in the Palmers Island area. The land has in the past been used to grow sugar cane however this has changed to Soy Beans. In combination with the operation of a rural caravan park the owner is looking to cultivate Tea Tree, a productive crop which is suitable to be planted within an effluent disposal field. The Land owner maintains cane production on land in the vicinity of the site and has a Production Area Entitlement of 47.3 Ha, this arable land is dedicated to the long term cultivation of sugar cane. **Refer Annexure H.** The effluent disposal field will comply with the requirements of the Environmental Guidelines – Use of Effluent by Irrigation (published by The Dept of Environment & Conservation).

Consultation has been sort from the Cane Farmers Association and is attached at **Annexure H** which confirms the land owner has committed to growing sugar cane in the area and has dedicated all arable land to the cultivation of sugar cane crops.

The above comments outline how this planning proposal recognises the importance of rural lands as required by this principle.

(c) recognition of the significance of rural land uses to the State and rural communities, including the social and economic benefits of rural land use and development,

Comment: Rural land use will be maintained as the planning proposal seeks to rezone the land to RU2 Rural Landscape, this will maintain the social and economic benefits of rural communities as required by this principle.

(d) in planning for rural lands, to balance the social, economic and environmental interests of the community,

Comment: This planning proposal is seeking to change the existing zoning to RU2 Rural Landscape which will allow the land to achieve the balance required by this principle. The Rural Landscape zoning retains the rural uses established on the site but also allows Rural Tourist uses like the rural caravan park. An E3 Environmental Management zone is proposed to protect the riparian areas on site. This combinations of zonings will provide the balance between the social, economic and environmental interests of the community.

(e) the identification and protection of natural resources, having regard to maintaining biodiversity, the protection of native vegetation, the importance of water resources and avoiding constrained land,

Comment: The only native vegetation onsite is within the Riparian Zone adjacent to the river, these areas have been included within an E3 Environmental Management zone for ongoing management and protection.

(f) the provision of opportunities for rural lifestyle, settlement and housing that contribute to the social and economic welfare of rural communities,

Comment: No permanent housing will be proposed as part of the rural caravan park. However these opportunities still remain under the proposed zoning in the future.

(g) the consideration of impacts on services and infrastructure and appropriate location when providing for rural housing,

Comment: No permanent housing will be proposed as part of the Caravan Park. However these opportunities still remain under the proposed zoning in the future.

(h) ensuring consistency with any applicable regional strategy of the Department of Planning or any applicable local strategy endorsed by the Director-General.

Comment: Refer to Section 2.3.1. which considers the relevant strategies.

2.3.5.3 State Environmental Planning Policy 71 – Coastal Policy

Aims

The aims of this Policy are as follows, as response to each aims is provided below where relevant.

(a) to protect and manage the natural, cultural, recreational and economic attributes of the New South Wales coast,

The rezoning will allow the existing natural attributes to improve and maintain the cultural, recreational and economic attributes to be retained and improved. The areas of Riparian zone onsite have been included within an E3 Environmental Management zone for ongoing management and protection.

(b) to protect and improve existing public access to and along coastal foreshores to the extent that this is compatible with the natural attributes of the coastal foreshore,

The existing public access to the river will be maintained and in the future will be improved as part of the development application for the project.

(c) to ensure that new opportunities for public access to and along coastal foreshores are identified and realised to the extent that this is compatible with the natural attributes of the coastal foreshore,

There is an existing public access to the river adjacent the site, this will be maintained.

(d) to protect and preserve Aboriginal cultural heritage, and Aboriginal places, values, customs, beliefs and traditional knowledge,

The land has been significantly altered through past practices, no Aboriginal heritage is likely to be affected as part of this Planning Proposal. Further consultation with the Yaegl Local Aboriginal Land Council is proposed prior to further public consultation.

(e) to ensure that the visual amenity of the coast is protected,

The visual amenity to the park will be improved as the rezoning will allow the park to relocated away from the river.

(f) to protect and preserve beach environments and beach amenity,

N/A

(g) to protect and preserve native coastal vegetation,

The areas of Riparian vegetation onsite have been included within a E3 Environmental Management zone for ongoing management and protection.

(h) to protect and preserve the marine environment of New South Wales,

N/A

(i) to protect and preserve rock platforms,

N/A

(j) to manage the coastal zone in accordance with the principles of ecologically sustainable development (within the meaning of section 6 (2) of the Protection of the Environment Administration Act 1991),

(a) the precautionary principle—namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

The areas of Riparian zone onsite have been included within an E3 Environmental Management zone for ongoing management and protection. No environmental degradation will result from the

rezoning. All future built works will comply with the required flooding and sea level rise controls/requirements.

(b) inter-generational equity—namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations,

The outcomes from the planning proposal will allow for the development of a rural caravan park that will service the future generations of the area while not impacting negatively on the existing environment. The Environmental Biodiversity will be maintained with the entire Riparian zone being included within an E3 Environmental Management zone.

(c) conservation of biological diversity and ecological integrity—namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration,

The Environmental Biodiversity on site will be maintained as the entire Riparian zone has been included within an E3 Environmental Management zone.

(d) improved valuation, pricing and incentive mechanisms—namely, that environmental factors should be included in the valuation of assets and services, such as:

Noted best practise techniques and environmentally responsible management techniques will be established and used in the construction and operation of the rural caravan park which will be allowable with the approval of this planning proposal.

(k) to ensure that the type, bulk, scale and size of development is appropriate for the location and protects and improves the natural scenic quality of the surrounding area, and

The outcome of the planning proposal will be to allow the approval, construction and operation of a rural caravan park. Further details will be provided at Development Assessment stage. The proposed park will maintaining the existing waterside and rural character established at Palmers Island.

(l) to encourage a strategic approach to coastal management.

This Planning Proposal complies with the Mid North Coast Regional Strategy, which is the main strategy document guiding future development in this area. The Riverbank areas of the site will be managed under an E3 Environmental Management zone.

Matters for consideration

The matters for consideration are the following a response to each matter for consideration is provided below where relevant.

(a) the aims of this Policy set out in clause 2,

Noted see above

(b) existing public access to and along the coastal foreshore for pedestrians or persons with a disability should be retained and, where possible, public access to and along the coastal foreshore for pedestrians or persons with a disability should be improved,

The public access to the river will be maintained and improved as part of the development of the caravan park. By including the riparian areas onsite in an E3 Environmental Management zone its management will be ensured under the zone aims and objectives.

(c) opportunities to provide new public access to and along the coastal foreshore for pedestrians or persons with a disability,

The existing access will be maintained and improved.

(d) the suitability of development given its type, location and design and its relationship with the surrounding area,

The planning proposal is to rezone an adjacent portion of land to relocate an existing caravan park. The type, location and design are suitable and will maintain and existing relationship with the locale. The E3 Environmental Management zone will improve the management of the sensitive riparian area.

(e) any detrimental impact that development may have on the amenity of the coastal foreshore, including any significant overshadowing of the coastal foreshore and any significant loss of views from a public place to the coastal foreshore,

The planning proposal will allow the rural caravan park to relocate further east away from the river. The amenity will be improved with this new location along with further improved management of the riparian zone under the proposed E3 Environmental Management zone.

(f) the scenic qualities of the New South Wales coast, and means to protect and improve these qualities,

These qualities will be maintained.

(g) measures to conserve animals (within the meaning of the Threatened Species Conservation Act 1995) and plants (within the meaning of that Act), and their habitats,

All sensitive flora and fauna on site is located with the riparian zone, these areas are included within the proposed E3 Environmental Management zone proposed as part of the Planning Proposal.

(h) measures to conserve fish (within the meaning of Part 7A of the Fisheries Management Act 1994) and marine vegetation (within the meaning of that Part), and their habitats

The planning proposal or outcomes from the planning impact will have no adverse impacts on the conservation of fish or marine vegetation. The proposed E3 Environmental Management zone over the riparian areas onsite will provide improved management being beneficial to fish, marine vegetation and habitat.

(i) existing wildlife corridors and the impact of development on these corridors,

The riparian zone along the riverbank forms a natural wildlife corridor. The riparian zone will included within the proposed E3 Environmental Management zone, improving the areas management for the long term.

(j) the likely impact of coastal processes and coastal hazards on development and any likely impacts of development on coastal processes and coastal hazards,

Coastal process has created the requirement to relocate the caravan park. The park will be designed with further threat from any coastal process in mind.

(k) measures to reduce the potential for conflict between land-based and water-based coastal activities,

No conflict will arise, access to the river will be maintained with public land adjacent the river bank.

(l) measures to protect the cultural places, values, customs, beliefs and traditional knowledge of Aboriginals,

The land has been significantly altered through past practices, no Aboriginal heritage are likely to be affected as part of this Planning Proposal. Consultation with the Yaegl Aboriginal Land Council is proposed.

(m) likely impacts of development on the water quality of coastal waterbodies,

There will be no impacts to the nearby water body, the creation of the E3 Environmental Management zone will ensure long term management of the riparian areas.

(n) the conservation and preservation of items of heritage, archaeological or historic significance,

The existing park site is Heritage Item I337 under the Clarence Valley LEP 2011 and is known as the Palmers Island Village Site.

The Statement of Significance from the heritage inventory:

> *This site is historically significant indicating the location of the school and part of the village of Palmers Island. Its demise tells much about the nature of the lower Clarence and problems associated with flooding and riverbank erosion. The site has archaeological potential and the camphor trees provide a reminder of the presence of a settlement. Interpretive signage would enhance the presentation of this site.*

Development of this site will include enhancements of the presentation of the site. This will be further investigated and outlined as part of the DA Process after the Rezoning has occurred. Any development of the site and the neighbouring lot (which is the subject of this planning proposal for rezoning) will enhance the heritage value of this locally significant heritage item.

(o) only in cases in which a council prepares a draft local environmental plan that applies to land to which this Policy applies, the means to encourage compact towns and cities,

The planning proposal will allow for the relocation of an existing caravan park, essentially in the same location within the Palmers Island Village.

2.3.6 Is the planning proposal consistent with applicable Ministerial Directions (s.117 directions)

The following are the Section 117 Ministerial Directions which apply to this Planning Proposal. A response where required is provided below each Direction or part of.

2.3.6.1 Ministerial Direction 5.1 Implementation of Regional Strategies

Objective

(1) The objective of this direction is to give legal effect to the vision, land use strategy, policies, outcomes and actions contained in regional strategies.

Where this direction applies

(2) This direction applies to land to which the following regional strategies apply:

- *(a) Far North Coast Regional Strategy*
- *(b) Lower Hunter Regional Strategy*
- *(c) Illawarra Regional Strategy*
- *(d) South Coast Regional Strategy*
- *(e) Sydney–Canberra Corridor Regional Strategy*
- *(f) Central Coast Regional Strategy, and*
- *(g) Mid North Coast Regional Strategy.*

When this direction applies

(3) This direction applies when a relevant planning authority prepares a planning proposal.

What a relevant planning authority must do if this direction applies

(4) Planning proposals must be consistent with a regional strategy released by the Minister for Planning.

The Mid North Coast Regional Strategy (MNCRS) is the Strategy which applies to the Palmers Island area and has been prepared by the Department of Planning. Key elements in the Strategy include providing a strategic direction for residential and economic growth in the Region along with an understanding of the environment and natural resources within the Mid North Coast Region.

While the Strategy provides it's most direct comments on the larger centres of Port Macquarie, Coffs Harbour, Grafton and Taree, the smaller towns and villages are also considered. The Strategy outlines the use of LEP's as a facilitator to allow for growth in tourism by providing more land for tourist type developments. A result of this Planning Proposal will seek a change in the current LEP to allow for the operation and upgrade to a rural caravan park, thus being in accordance with the MNCRS and complying with Ministerial Direction 5.1 Implementation of Regional Strategies.

The MNCRS recognises Regionally Significant Farmland and states that this land should not be available for future urban or rural residential rezoning other than in the limited circumstances as permitted by the Mid North Coast Farmland Mapping Project Final Recommendations Report (2008). The Planning Recommendations (Chapter 5) in the Mid North Coast Farmland Mapping Project, recommend lands identified a Regionally Significant Farmland not be rezoned to Urban or Rural Residential uses.

The Mid North Coast Farmland Mapping Project lists six objectives to guide development in regionally significant farmland areas. These objectives are shown below and a comment provided on each.

1. *To establish the priority of legitimate rural uses over non-rural uses.*

Comment: The proposal seek to rezone portion of regionally significant farmland from Zone RU1 Primary Production to Zone RU2 Rural Landscape and the riverbank (Riparian Area) to Zone E3 Environmental Management. The RU2 Zone will maintain the established rural use as the priority for the land. The majority of the new RU2 zoned land will be used as a tea tree plantation in combination with the proposed rural caravan parks effluent disposal system.

2. *To recognise and conserve the best farmland in the region for current and future agricultural uses.*

Comment: This proposal is seeking to maintain a rural use on site for the future and present on portions of the site. The proposed zoning (RU2 Rural Landscape) will retain the rural uses onsite except for the Riparian Area which is to become an Environmental Management Zone (E3). This proposed zoning will maintain, recognise and conserve the regionally significant farmland onsite for current and future agricultural uses.

3. *To keep options open for future generations to produce a range of agricultural goods throughout the region.*

Comment: As outlined above this proposal is maintaining rural uses on site for the future. The proposed zoning (RU2 Rural Landscape) will retain the present rural uses onsite except for the Riparian Area which is to become an Environmental Management Zone (E3). This complies with the objective and retains agricultural option for future generations.

4. *To allow for a range of activities that support agriculture, including farm diversification and value-adding, without compromising long-term agricultural production potential.*

Comment: This proposal achieves this objective by allowing diversification and value adding on this site by employing both agricultural uses (tea tree plantation) in combination with a rural tourist use (a rural caravan park). The RU2 zoning will ensure the long term protection of the land for rural uses protecting the long term agricultural production potential of the site.

5. *To protect agricultural land from adjacent development that may compromise agricultural uses.*

Comment: Directly adjacent to the site is the Township of Palmers Island which is zoned Residential R2 in Councils LEP. This proposal maintains the rural zoning seeking only a change for RU1 to RU2 Rural Landscape and protection of the riparian areas under the E3 Environmental Management Zone. The new zoning will allow rural uses that can provide separation between agricultural uses with high environmental impacts and the residential Township of Palmers Island.

6. *To avoid creating conditions where conflict will arise between rural and non-rural land users.*

Comment: As outlined in Objective 5 the proposal will allow for rural uses that will provide separation between agricultural uses with high environmental impacts and the residential Township of Palmers Island. This will minimise conflict between agricultural and non-rural land uses and still maintain the Regionally Significant Farmland in the long term.

The proposed change in zoning to RU2 Rural Landscape and E3 Environmental Management is consistent with the Regional Farmland Objectives of the Planning Recommendations within the Mid North Coast Farmland Mapping Project Final Recommendations Report

The MNCRS emphasizes "*the need to ensure that the character and appeal of coastal towns, villages and their hinterland, which are drawcards for visitors, is not lost*" (p.8) in order to protect tourism as a significant component of the regional economy. The Mid North Coast region receives about 5.4 million visitors per year who collectively spend about $1.4 billion. The MNCRS estimates that tourism employs more than 7000 people in the region.

The tourism development objectives of the MNCRS include:

- *offering a range of tourism experiences and forms of tourist accommodation in urban areas.*

Comment: The proposal will facilitate an increase in the caravan park's capacity from 48 sites under its present license to 145 sites, immediately adjacent to the historic settlement of Palmers Island Village. This will offset some of the anticipated loss of tourist site capacity from elsewhere in the Lower Clarence region (e.g. Blue Dolphin Tourist Park, Yamba), and thereby will protect the economic base gained from the region's tourist attractions. Furthermore, an increase in capacity will generate additional employment opportunities for the region's service industry. Therefore, the proposal is consistent with this objective in that it will offer a form of tourist accommodation that is otherwise diminishing in the region.

- *locating development away from the Pacific Highway.*

Comment: The proposal will be located about 5.7km east of the Pacific Highway, approximately midway between the highway and Yamba. Therefore, the proposal is consistent with this objective in that it will be located away from the Pacific Highway.

The proposal complies with the objectives of this direction. The proposal incorporates the continuation of an existing use while adding an innovative agricultural component. Nothing in the proposal will prevent future uses of this site being suitable for other rural practices.

The Environmental & Natural Resources actions of the MNCRS include: -

- *Local environmental plans will protect and zone land with high environmental, vegetation, habitat, riparian, aquatic, coastal or corridor values for environmental protection.*

Comment: All Riparian land has been included in the proposed E3 Environmental Management. Zone.

- *Local environmental plans will include provisions to encourage habitat and corridor establishment in future zoning of land with environmental and rural values.*

Comment: Relevant provisions are included under the E3 Environmental Management Zone clauses of the CLEP 2011.

Consistency

(5) A planning proposal may be inconsistent with the terms of this direction only if the relevant planning authority can satisfy the Director-General of the Department of Planning (or an officer of the Department nominated by the Director-General), that the extent of inconsistency with the regional strategy:

(a) is of minor significance, and

(b) the planning proposal achieves the overall intent of the regional strategy and does not undermine the achievement of its vision, land use strategy, policies, outcomes or actions.

The MNCRS recognises Regionally Significant Farmland in the the Mid North Coast Farmland Mapping Project Final Recommendations Report (2008). The recommendations in the Mid North Coast Farmland Mapping Project Final Recommendations Report, recommend lands identified a Regionally Significant Farmland not be rezoned to Urban or Rural Residential uses. The proposal is seeking to rezone the site from Zone RU1 Primary Production to Zone RU2 Rural Landscape and the riverbank (Riparian Area) to Zone E3 Environmental Management.

The land will retain rural uses as allowed within the RU2 Rural Landscape zone allowing for both agricultural uses and rural tourist uses. By retaining this zoning the Regionally Significant Farmland maintains rural uses as the priority. The Proposal is consistent with the Regional Farmland Objectives of the Planning Recommendations within the Mid North Coast Farmland Mapping Project Final Recommendations Report.

The planning proposal and its outcomes are consistent with the objectives and actions of the Mid North Coast Regional Strategy.

2.3.6.2 Ministerial Direction 1.2 Rural Zones

Objective

(1) The objective of this direction is to protect the agricultural production value of rural land.

Where this direction applies

(2a) Clause 4(a) of this direction applies to all relevant planning authorities.

(3) This direction applies when a relevant planning authority prepares a planning proposal that will affect land within an existing or proposed rural zone (including the alteration of any existing rural zone boundary).

What a relevant planning authority must do if this direction applies

(4) A planning proposal must:

(a) not rezone land from a rural zone to a residential, business, industrial, village or tourist zone.

(b) not contain provisions that will increase the permissible density of land within a rural zone (other than land within an existing town or village).

This Planning Proposal is seeking to rezone a 1.63ha part of Lot 27 DP 1130643 from Zone RU1 Primary Production to Zone RU2 Rural Landscape and the riverbank (Riparian Area) Zone E3 Environmental Management as shown illustrated on the Zoning Proposed and Existing Plan at **Annexure A**. The proposal will retain the rural zoning for the majority of the site as required by this Ministerial Direction except for the riparian area within the site which is proposed to change to an environmental management zone.

Consistency

(5) A planning proposal may be inconsistent with the terms of this direction only if the relevant planning authority can satisfy the Director-General of the Department of Planning (or an officer of the Department nominated by the Director-General) that the provisions of the planning proposal that are inconsistent are:

(a) justified by a strategy which:

(i) gives consideration to the objectives of this direction,

(ii) identifies the land which is the subject of the planning proposal (if the planning proposal relates to a particular site or sites), and

(iii) is approved by the Director-General of the Department of Planning, or

(b) justified by a study prepared in support of the planning proposal which gives consideration to the objectives of this direction, or

(c) in accordance with the relevant Regional Strategy or Sub-Regional Strategy prepared by the Department of Planning which gives consideration to the objective of this direction, or

(d) is of minor significance.

The proposed rezoning is consistent with Clause 4(a) of this direction, the proposal seeks to change the zone from RU1 to RU2 Rural Landscape, retaining its rural zoning.

As outlined in 2.3.6.1 the planning proposal involves land mapped as Regionally Significant Farmland under the Mid North Coast Farmland Mapping Project. The proposed change in zoning to RU2 Rural Landscape and E3 Environmental Management is consistent with the Regional Farmland Objectives of the Planning Recommendations within the Mid North Coast Farmland Mapping Project Final Recommendations Report. The planning proposal and its outcomes are also consistent with the objectives and actions of the Mid North Coast Regional Strategy.

2.3.6.3 Ministerial Direction 1.5 Rural Lands

Objectives

(1) The objectives of this direction are to:

(c) protect the agricultural production value of rural land,

(d) facilitate the orderly and economic development of rural lands for rural and related purposes.

Where this direction applies

(2) (a) This direction applies to all planning proposals to which State Environmental Planning Policy (Rural Lands) 2008 applies.

When this direction applies

(3) This direction applies when:

(a) a relevant planning authority prepares a planning proposal that will affect land within an existing or proposed rural or environment protection zone (including the alteration of any existing rural or environment protection zone boundary) or

(b) a relevant planning authority prepares a planning proposal that changes the existing minimum lot size on land within a rural or environment protection zone.

What a relevant planning authority must do if this direction applies

(4) A planning proposal to which clauses 3(a) or 3(b) apply must be consistent with the Rural Planning Principles listed in State Environmental Planning Policy (Rural Lands) 2008.

(5) A planning proposal to which clause 3(b) applies must be consistent with the Rural Subdivision Principles listed in State Environmental Planning Policy (Rural Lands) 2008.

Refer to Section 2.3.5.2 State Environmental Planning Policy (Rural Land) 2008 which lists the principles of the SEPP and responds to each.

Consistency

(6) A planning proposal may be inconsistent with the terms of this direction only if the relevant planning authority can satisfy the Director-General of the Department of Planning (or an officer of the Department nominated by the Director-General) that the provisions of the planning proposal that are inconsistent are:

(a) justified by a strategy which:

i. gives consideration to the objectives of this direction,

ii. identifies the land which is the subject of the planning proposal (if the planning proposal relates to a particular site or sites, and

iii. is approved by the Director-General of the Department of Planning and is in force, or

(b) is of minor significance.

The Planning Proposal is consistent with the Aim and Principles of State Environmental Planning Policy (Rural Lands) 2008 as required by this Ministerial Directions. Refer to **Section 2.3.5.2.**

2.3.6.4 Ministerial Direction 3.2 Caravan Parks and Manufactured Home Estates

Objectives

(1) The objectives of this direction are:

(a) to provide for a variety of housing types, and

(b) to provide opportunities for caravan parks and manufactured home estates.

Where this direction applies

(2) This direction applies to all relevant planning authorities.

When this direction applies

(3) This direction applies when a relevant planning authority prepares a planning proposal.

What a relevant planning authority must do if this direction applies

(4) In identifying suitable zones, locations and provisions for caravan parks in a planning proposal, the relevant planning authority must:

(a) retain provisions that permit development for the purposes of a caravan park to be carried out on land, and

(b) retain the zonings of existing caravan parks, or in the case of a new principal LEP zone the land in accordance with an appropriate zone under the Standard Instrument (Local Environmental Plans) Order 2006 that would facilitate the retention of the existing caravan park.

(5) In identifying suitable zones, locations and provisions for manufactured home estates (MHEs) in a planning proposal, the relevant planning authority must:

(a) take into account the categories of land set out in Schedule 2 of SEPP 36 as to where MHEs should not be located,

(b) take into account the principles listed in clause 9 of SEPP 36 (which relevant planning authorities are required to consider when assessing and determining the development and subdivision proposals), and

(c) include provisions that the subdivision of MHEs by long term lease of up to 20 years or under the Community Land Development Act 1989 be permissible with consent.

Consistency

(6) A planning proposal may be inconsistent with the terms of this direction only if the relevant planning authority can satisfy the Director-General of the Department of Planning (or an officer of the Department nominated by the Director-General) that the provisions of the planning proposal that are inconsistent are:

(a) justified by a strategy which:

(i) gives consideration to the objective of this direction, and

(ii) identifies the land which is the subject of the planning proposal (if the planning proposal relates to a particular site or sites), and

(iii) is approved by the Director-General of the Department of Planning, or

(b) justified by a study prepared in support of the planning proposal which gives consideration to the objective of this direction, or

(c) in accordance with the relevant Regional Strategy or Sub-Regional Strategy prepared by the Department of Planning which gives consideration to the objective of this direction, or

(d) of minor significance.

This Planning Proposal is to provide further zoned land to maintain the operation of an existing rural caravan park. The planning proposal will allow for the rezoning of 1.63ha of land from Zone RU1 Primary Production to Zone RU2 Rural Landscape and the riverbank (Riparian Area) to Zone E3 Environmental Management. The proposal complies with this ministerial direction.

2.3.6.5 Ministerial Direction 4.1 Acid Sulfate Soils

Objective

(1) The objective of this direction is to avoid significant adverse environmental impacts from the use of land that has a probability of containing acid sulfate soils.

Where this direction applies

(2) This direction applies to all relevant planning authorities that are responsible for land having a probability of containing acid sulfate soils, as shown on Acid Sulfate Soils Planning Maps held by the Department of Planning.

When this direction applies

(3) This direction applies when a relevant planning authority prepares a planning proposal that will apply to land having a probability of containing acid sulfate soils as shown on the Acid Sulfate Soils Planning Maps.

What a relevant planning authority must do if this direction applies

(4) The relevant planning authority must consider the Acid Sulphate Soils Planning Guidelines adopted by the Director-General of the Department of Planning when preparing a planning proposal that applies to any land identified on the Acid Sulfate Soils Planning Maps as having a probability of acid sulfate soils being present.

(5) When a relevant planning authority is preparing a planning proposal to introduce provisions to regulate works in acid sulfate soils, those provisions must be consistent with:

(a) the Acid Sulfate Soils Model LEP in the Acid Sulfate Soils Planning Guidelines adopted by the Director-General, or

(b) such other provisions provided by the Director-General of the Department of Planning that are consistent with the Acid Sulfate Soils Planning Guidelines.

(6) A relevant planning authority must not prepare a planning proposal that proposes an intensification of land uses on land identified as having a probability of containing acid sulfate soils on the Acid Sulfate Soils Planning Maps unless the relevant planning authority has considered an acid sulfate soils study assessing the appropriateness of the change of land use given the presence of acid sulfate soils. The relevant planning authority must provide a copy of any such study to the Director-General prior to undertaking community consultation in satisfaction of section 57 of the Act.

(7) Where provisions referred to under paragraph (5) of this direction have not been introduced and the relevant planning authority is preparing a planning proposal that proposes an intensification of land uses on land identified as having a probability of acid sulfate soils on the Acid Sulfate Soils Planning Maps, the planning proposal must contain provisions consistent with paragraph (5).

Consistency

(8) A planning proposal may be inconsistent with the terms of this direction only if the relevant planning authority can satisfy the Director-General of the Department of Planning (or an officer of the Department nominated by the Director-General) that the provisions of the planning proposal that are inconsistent are:

(a) justified by a study prepared in support of the planning proposal which gives consideration to the objective of this direction, or

(b) of minor significance.

This planning proposal is to rezoning a small portion of land within the Clarence Valley Local Environmental Plan 2011 (CLEP 2011), which will require only minor amendments to the LEP Zoning Map and Plan. The CLEP 2011 currently contains Acid Sulphate Soil provisions which will be maintained and apply to this site.

2.3.6.6 Ministerial Direction 4.3 Flood Prone Land

Objectives

(1) The objectives of this direction are:

(a) to ensure that development of flood prone land is consistent with the NSW Government's Flood Prone Land Policy and the principles of the Floodplain Development Manual 2005, and

(b) to ensure that the provisions of an LEP on flood prone land is commensurate with flood hazard and includes consideration of the potential flood impacts both on and off the subject land.

Where this direction applies

(2) This direction applies to all relevant planning authorities that are responsible for flood prone land within their LGA.

When this direction applies

(3) This direction applies when a relevant planning authority prepares a planning proposal that creates, removes or alters a zone or a provision that affects flood prone land.

What a relevant planning authority must do if this direction applies

(4) A planning proposal must include provisions that give effect to and are consistent with the NSW Flood Prone Land Policy and the principles of the Floodplain Development Manual 2005 (including the Guideline on Development Controls on Low Flood Risk Areas).

A Flood Assessment has been prepared for the proposal which models the flood liability of the site and flood emergency management procedure for the rural caravan park. This report is attached at **Annexure G.**

The Flood Assessment refers to the State Emergency Service (SES) prepared "Clarence Valley Local Flood Plan" (June 2012). This Local Flood Plan details arrangements for evacuation of caravan parks and relocation of caravans.

The flood liability for this site is the same as that of the two other caravan parks on Palmers Island Salt Water Big 4, Yamba Clarence Coast at 286 O'Keefes Lane, Palmers Island and Fishing Haven Caravan Park at 35 River Road, Palmers Island.

The evacuation notes for the above caravan parks identify:

- "Access closes at 2.1 m on Yamba Road to Maclean";
- "Caravan Park is advised when Clarence River Flood Warning is issued, to allow visitors to evacuate before road closure commences".

As mentioned above the flood liability of the above two sites is the same as the proposed development site, and thus the same evacuation procedures should be applied.

The development site can expect to be inundated at about a once in 5 to 10 years Average Recurrence Interval (ARI) and as the flood magnitude increases, the flood hazard across the site will increase from "not inundated" to "high flood hazard".

Evacuation of the proposed caravan park and relocation of the caravans is the appropriate response.

With respect to evacuation and relocation of caravans, it is noted:

- Retreat to the Pacific Highway along Yamba Road is the best option, given that the Pacific Highway thus provides linkage to Grafton and Ballina and other parts of the NSW road network;
- There is a co-relation between the recorded flood peaks at Grafton and Maclean, the critical gauge height at Maclean for closure of the Yamba Road (2.1 m as per the Local Flood Plan) occurs when peak flood heights at Grafton are in the region of 5.2 m to 6.0 m.
- The report illustrate that for the flood heights of interest at Grafton (Gauge height 5.2 m to 6.0 m) times of travel are mainly in the range of 12 to 18 hours, but in some floods, the time of travel for the peak has been as low as 6 hours.
- The flood warning time available for flood heights above 5.0 m at Grafton is 6 to 12 hours.
- Combination of the warning time available at Grafton and the time of travel from Grafton for the flood peak to close Yamba Road suggests that, once a predicted flood peak of Gauge Height 5 m is given at Grafton (midway between a "moderate" and "major" flood, 12 to 18 hours is available to evacuate the proposed development site.

This report confirms there is between 12 to 18 hours between the time an order to evacuate is issued and the flood peak to close Yamba Road. This is adequate time to evacuate all persons from the site to areas not subject to risk of flooding. With such a large and predictable warning time and flood pattern, park guests can easily relocate to areas like Coffs Harbour or Port Macquarie to the South, Byron Bay and the Gold Coast to the North or Glen Innes and Inverell to the west to evade flood waters.

At Development Application stage a detailed Flood Evacuation Plan is to be provided outlining a step by step procedure on how the caravan park will undertaken an evacuation.

The following are the sections of the Grafton & Lower Clarence Floodplain Risk Management Plan 2007 (G&LCFRMP) (Italics) which relate to the subject site. Each issue is addressed below.

5.5.9 Palmers Island

The village of Palmers Island is located on the west side of Palmers Island, adjacent to the Clarence River, approximately 6km upstream of Iluka. The whole island would be inundated in a 20 year flood. It has been noted that there are 54 premises located within the village, 10 of which are considered to be flooded above flood level in the 100 year flood (Maclean Shire Council, 1999). There is also significant riverbank erosion that has threatened a number of properties, and prompted a voluntary purchase scheme to remove those properties at greatest risk (ie subject to both river bank erosion and flood risk).

Palmers Island is considered to represent a high flood risk, due to the number of buildings potentially affected by flooding and likely isolation problems if early evacuation is not achieved. Any intensification of existing development through future subdivision or rezoning should be avoided. There may still remain one or two dwellings that qualify for voluntary purchase due to the continuing bank erosion and flooding threat. Other dwellings may qualify for inclusion in the valley-wide house raising scheme.

The then Department of Infrastructure Planning and Natural resources **declined** to fund the purchase of the caravan parks which are located on Palmers Island, as a result they need to be relocated to become viable and comply with the local planning controls. This Planning Proposal is the first step in the relocation and upgrade of the Shady Nook Caravan Park. To comply with the G&LCMRMP a Flood Assessment has been prepared (**Annexure G)** which details the flood liability of the site and confirms there is between 12 to 18 hours between the time an order to evacuate is issued and the flood peak will close Yamba Road. This is adequate time to evacuate all persons from the site to areas not subject to risk of flooding.

5.7 CARAVAN PARKS

About 26 caravan parks are thought to be located within the Lower Clarence Valley floodplain. SES Flood Plans suggest that many of these parks occupy flood-prone locations. As well as providing tourist accommodation, the majority of these parks (notably in Grafton, South Grafton, Maclean, Palmers Island, Yamba and Iluka) provide at least some sites for long-term stays, which means that residents are permitted to live there. Council needs to pay special attention to this exposure.

Clarence Valley Council could also consider the recommendations of a recent report on management of flood-prone caravan parks in NSW (Yeo & Grech, 2005). These recommendations include:

- *A distinction should be drawn between tourist related developments (traditional caravan parks which often evolve into modern tourist complexes) and permanent housing (residential parks and manufactured home estates).*

No permanent accommodation will be proposed in the Caravan Park.

- *The flood related development controls that would normally apply to standard residential housing, should at a minimum be applied to residential parks (e.g., ground and floor level controls). (This is recognised in the proposed flood DCP). It could be argued that more stringent controls should be imposed, since residents tend to be less equipped to cope with flooding. This must be balanced against the social cost of discouraging affordable housing.*

The flood related development controls have been accounted for in the initial design of the park (Attached at **Annexure C**). This will be further refined and assessed as part of the Development Application process.

- *Conversely, lower standards could be applied to purely tourist related developments on the basis that the social and economic consequences of flooding would be less than those associated with permanent housing. This position recognises the economic planning imperative of locating tourist related developments in proximity to natural features such as rivers.*

The proposed park will be tourist related with no application for permanent residence.

- *There should be no distinction between tourist parks and residential parks when considering risk to human life. If depths and velocities are high, and if the rate of rise of floodwaters is such that people could be trapped in dangerous conditions, then development should not be permitted.*

Noted, a Detailed Flood Assessment has been prepared (**Annexure G**) which confirms the site will have flow velocities of 0.3m to 0.5m/sec which are not considered high. The report also confirms there is between 12 to 18 hours between the time an order to evacuate is issued and flooding will close Yamba Road.

- *The specific structural characteristics of caravans, rigid annexes and manufactured homes need to be individually recognised within planning controls. Measures to prevent structures floating away during floods, and to minimise physical damage, need to be employed, requiring engineering solutions.*

Noted, these engineering solutions will be employed in the detailed design of the rural caravan park.

- *More needs to be done to require managers of all flood-prone caravan parks to advise occupants of the risk and to prepare current, site-specific, written Flood Action Plans. An approval system could provide a mechanism to implement, monitor and review awareness programs and evacuation strategies. Means of raising awareness of flood risk include constructing flood markers and displaying the Flood Action Plan in all dwellings. Among other points, plans should take into account the unique circumstances of each park: the extent and depth of the 20 year, 100 year and probable maximum floods; the number and manoeuvrability of dwellings; the number and mobility of tourists and residents; and the route, resources and time required to achieve a safe evacuation.*

These recommendations have been taken into account and a site specific Flooding Evacuation Plan will be prepared for the Park and submitted for approval with the Development Application. This will ensure the protection of human life.

Whether to prohibit caravan parks and manufactured home estates within floodplains is ultimately a strategic planning decision. This may not lead to the removal of existing caravan parks and manufactured home estates, but could prohibit new development in highly hazardous areas of floodplains and act as a clear statement of policy to assist in restricting the expansion of existing developments. Development Control Plans (DCPs) can provide an appropriate mechanism to impose controls on new development and the expansion of existing ones. DCPs could be extended in application to provide policies for the continuing licensing of caravan parks under the Local Government Act and Regulations, to manage flood related risks through awareness programs and the establishment of Flood Action Plans.

Given the large number of potentially flood-prone caravan parks located within the area of Clarence Valley Council, it is recommended that Council in liaison with the SES conduct an investigation of flood risk on a site-specific basis. This risk assessment should identify:

- *the location of caravan parks within the floodplain and the degree of hazard they are subject to;*
- *the warning times available to the park and the available evacuation routes;*

- *the resources required to evacuate the people and moveable property from the park; and*
- *policies for both existing parks and future parks within the floodplain.*

The risk assessment should also be mindful of the particular "elements at risk" within each park - the number of permanent residents, the number of tourists during peak season, the number of moveable vans, etc.

A Flood Evacuation Plan will be development in-conjunction with the State Emergency Service and in accordance with the Clarence Valley Local Flood Plan 2012

This will provide the required level of safety to ensure the protection of human life in an area subject to flood impacts. To continue the operation of a caravan park all design measures including raising the cabins, current flood and evacuation plans etc will be incorporated to maintain the level of safety required.

6.2.6 Caravan Parks

Given the large number of potentially flood-prone caravan parks located within the area of Clarence Valley Council, it is recommended that Council in liaison with the SES conduct an investigation of flood risk on a site-specific basis. This risk assessment should identify:

- *the location of caravan parks within the floodplain and the degree of hazard they are subject to;*
- *the warning times available to the park and the available evacuation routes;*
- *the resources required to evacuate the people and moveable property from the park; and*
- *policies for both existing parks and future parks within the floodplain.*

The Clarence Valley Local Flood Plan 2012 has been prepared taking into account these recommendations. The Flood Assessment attached at **Annexure G** confirms the low risk flood liability and that there is between 12 and 18 hours of notice before flood waters close Yamba Road. With such a large and predictable warning time and flood pattern, park guests can easily relocate to areas like Coffs Harbour or Port Macquarie to the South, Byron Bay and the Gold Coast to the North or Glen Innes and Inverell to the west to evade flood waters.

A site specific Flooding Evacuation Plan will be prepared for the Park and submitted for approval with the Development Application. The Flood Evacuation Plan will be development in-conjunction with the State Emergency Service and in accordance with the Clarence Valley Local Flood Plan 2012. This will provide the required level of safety to ensure the protection of human life in an area subject to flood impacts. To continue the operation of a caravan park all design measures including raising the cabins, current flood and evacuation plans etc will be incorporated to maintain the level of safety required.

(5) A planning proposal must not rezone land within the flood planning areas from Special Use, Special Purpose, Recreation, Rural or Environmental Protection Zones to a Residential, Business, Industrial, Special Use or Special Purpose Zone.

The Planning Proposal is seeking to rezone land from Zone RU1 Primary Production to Zone RU2 Rural Landscape and the riverbank (Riparian Area) to Zone E3 Environmental Management as shown illustrated in the Zoning Proposed and Existing Plan at **Annexure A**. Essentially the Zones of the land will remain Rural.

(6) A planning proposal must not contain provisions that apply to the flood planning areas which:

(a) permit development in floodway areas,

The land subject to this Planning Proposal is not in a Floodway as shown in Figure 3.3 of the G&LCFRMP.

(b) permit development that will result in significant flood impacts to other properties,

No significant flooding impact to other properties will result form the outcomes of this Planning Proposal.

(c) permit a significant increase in the development of that land,

The Planning Proposal will allow the increase in size of the existing caravan park however it is not considered significant. No permanent accommodation sites are proposed.

(d) are likely to result in a substantially increased requirement for government spending on flood mitigation measures, infrastructure or services, or

No increase in government spending will result from the outcomes of this Planning Proposal.

(e) permit development to be carried out without development consent except for the purposes of agriculture (not including dams, drainage canals, levees, buildings or structures in floodways or high hazard areas), roads or exempt development.

Development Consent will be required for the Local Council.

(7) A planning proposal must not impose flood related development controls above the residential flood planning level for residential development on land, unless a relevant planning authority provides adequate justification for those controls to the satisfaction of the Director-General (or an officer of the Department nominated by the Director-General).

(8) For the purposes of a planning proposal, a relevant planning authority must not determine a flood planning level that is inconsistent with the Floodplain Development Manual 2005 (including the Guideline on Development Controls on Low Flood Risk Areas) unless a relevant planning authority provides adequate justification for the proposed departure from that Manual to the satisfaction of the Director-General (or an officer of the Department nominated by the Director-General).

Consistency

(9) A planning proposal may be inconsistent with this direction only if the relevant planning authority can satisfy the Director-General (or an officer of the Department nominated by the Director-General) that:

(a) the planning proposal is in accordance with a floodplain risk management plan prepared in accordance with the principles and guidelines of the Floodplain Development Manual 2005, or

(b) the provisions of the planning proposal that are inconsistent are of minor significance.

This Planning Proposal is consistent with Ministerial Direction 4.3 Flood Prone Land.

2.3.7 (Section C) Is there any likelihood that critical habitat or threatened species, populations or ecological communities, or their habitats, will be adversely affected as a result of the proposal

It is highly unlikely that any critical habitat or threatened species, populations or ecological communities, or their habitats, will be adversely affected as a result of amending the LEP to allow for the relocation of the Shady Nook Caravan Park. The land on which the park is to move to is clear of any significant vegetation and has been cultivated for sugar cane since the mid 60's.

A E3 Environmental Management zone is proposed across all riparian areas on site including all the land within the immediate management line to protect the biodiversity values. This zoning will

ensure the habitat and ecological communities are managed in the long tern in accordance with the aims and objectives of the Zone E3 Environmental Management zone.

2.3.8 Are there any other likely environmental effects as a result of the planning proposal and how are they proposed to be managed

The site had been identified by Clarence Valley Council as being affected by the Grafton and Lower Clarence River Floodplain Risk Management Plan and the Palmers Island Riverbank Management Plan 1995 (PIRMP). These plans have been addressed below.

The Grafton and Lower Clarence River Floodplain Risk Management Plan

The Grafton and Lower Clarence River floodplain risk management plan 1% Annual Exceedence Probability water level in the vicinity of the site is 2.9m AHD and the Probable Maximum Flood Level is 4.4m AHD. Any development on the site needs to be in compliance with the flood plain management controls listed in the Clarence Valley DCP for development in rural zones.

A Flood Assessment has been prepared for the proposal (refer to **Annexure G**), it must be noted that at this strategic stage of the project a detailed Flood Evacuation Plan is not possible due to the required level of park design. The Flood Assessment documents a broad approach to flood evacuation planning and shows that there is between 12 and 18 hours between the onset of a flood threat and when flood waters will prevent the evacuation of the Park along Yamba Road. With such a large and predictable warning time and flood pattern, park guest can easily relocate to areas like Coffs Harbour or Port Macquarie to the South, Byron Bay and the Gold Coast to the North or Glen Innes and Inverell to the west to evade flood waters.

A detailed Site Specific Flood Evacuation Plan is to be prepared at Development Application Stage where a final park design is confirmed and further details can be added, concluding with an approval for a Caravan Park with a comprehensive site specific Flood Evacuation Plan.

At the Strategic level the consent authority needs to be assured that in the event of a flood on the site there is adequate time for persons on site to evacuate well before any risk to human life.

The following is an assessment from Part D Floodplain Management Controls of the Development in Rural Zones DCP 2011. This application is for rezoning of the land, which will allow for the DA for a Caravan Park. Further assessment of the proposed Caravan Park will be undertaken in the subsequent DA.

> ***D3.1*** *Performance Criteria All development requiring Council consent must comply with the following performance criteria:*
>
> *(a) The proposed development should not result in any increased risk to human life.*

The rezoning will not allow a development that will increase any risk to human life. As the rural caravan park will be a commercial operation all safety regulations will need to be imposed to operate the park. This will ensure the safe operation of the caravan park.

> *(b) The additional economic and social costs which may arise from damage to property from flooding should not be greater than that which can reasonably be managed by the property owner and general community.*

The rezoning is to allow for the relocation and improvements to a once existing rural caravan park. The possible impacts from flooding have been taken into consideration and can be reasonably managed by the owner.

(c) The proposal should only be permitted where effective warning time and reliable access is available for evacuation from an area potentially affected by floods to an area free of risk from flooding. Evacuation should be consistent with any relevant flood evacuation strategy.

The State Emergency Service monitor rainfall events and creek levels in the upper catchment and provide details to the community on the possible threat of incoming flood events. A Flood Assessment is attached at **Annexure G** which confirms there is 12 to 18 hours warning time to evacuate the park.

(d) Development should not detrimentally increase the potential flood effects on other development or properties either individually or in combination with the cumulative impact of development that is likely to occur in the same floodplain.

The rezoning is to allow for the relocation and improvements to a rural caravan park. The possible impacts from flooding will not increase the potential for flooding on other developments.

(e) Motor vehicles are able to be relocated, undamaged, to an area with substantially less risk from flooding, within effective warning time.

The existing road network provides adequate vehicle distribution to relocate vehicles in the event of flooding. A Flood Assessment is attached at **Annexure G** which confirms vehicle routes to flood free destinations will remain accessible for up to 12 hours once notification of a flood has occurred, given adequate time for evacuation.

(f) Procedures would be in place, if necessary, (such as warning systems, signage or evacuation drills) so that people are aware of the need to evacuate and relocate motor vehicles during a flood and are capable of identifying an appropriate evacuation route.

These will be incorporated as part of the caravan park evacuation procedures.

(g) Development should not result in significant impacts upon the amenity of an area by way of unacceptable overshadowing of adjoining properties, privacy impacts (eg. By unsympathetic house-raising) or by being incompatible with the streetscape or character of the locality.

The rezoning is to allow for the relocation and improvements to a rural caravan park. The amenity of the area will not be changed or altered from what was is existing. Further details of the park will be included in the subsequent DA.

(h) Proposed development must be consistent with Ecological Sustainable Development (ESD) principles.

The DA for the rural caravan park will be in accordance with ESD principles.

(i) Development should not prejudice the economic viability of any Voluntary Acquisition Scheme.

No Voluntary Acquisition Scheme applies to this site.

***D5.1** Performance Criteria Development involving filling of flood liable land must comply with the following criteria:*

(a) The filling of flood liable land must not increase the flood risk on other land within the floodplain.

Noted, only minimal filling will be proposed if required. Further investigations into any fill will be undertaken at DA stage.

(b) Filling and associated works must not have any unacceptable associated environmental impacts such as detrimental affects on the ecology of riparian corridors.

Noted, only minimal filling will be proposed if required. The proposal is not within the vicinity of any significant environmental features.

When assessing proposals for development or other activity within the floodplain, Council will take into consideration the following specific matters.

(a) Measures employed to mitigate the potential impact of flooding (eg. house raising) must be undertaken in a manner which minimises the impact upon the amenity and character of the locality.

Any measures taken to mitigate the potential impacts of flooding must be suitable for a rural caravan park taking advantage of its location next to the Clarence River, thus they will also be character with the locality of Palmers Island

(b) The design of car parking (enclosed or uncovered) and associated driveways should not result in unacceptable environmental or amenity impacts. Unacceptable impacts may include visual intrusion from elevated driveways and parking structures and overshadowing of adjoining residential properties in excess of Council's relevant standards.

Noted, further details will be provided in the subsequent DA.

(c) The proposal must not constrain the orderly and efficient utilisation of the waterways for multiple purposes.

Noted, the rural caravan park proposal will only improve the utilisation of the waterway.

(d) The proposal must not adversely impact upon the recreational, ecological, aesthetic or utilitarian use of the waterway corridors, and where possible, should provide for their enhancement.

Noted, the rural caravan park proposal will only improve the utilisation of the waterway.

(e) Proposals for house raising must provide appropriate documentation including:

i) a report from a suitably qualified engineer to demonstrate that the raised structure will not be at risk of failure from the forces of floodwaters in a 100 year flood; and

Noted, if proposed the information will be included in the DA for the caravan park.

ii) the provision of details such as landscaping and architectural enhancements which ensure that the resultant structure will not result in significant adverse impacts upon the amenity and character of an area.

Noted, if proposed the information will be included in the DA for the caravan park.

***D7.1** Applications must include information that addresses all relevant controls listed above, and the following matters as applicable.*

***D7.3** Development applications affected by this plan shall be accompanied by a survey plan showing:-*

(a) The position of the existing building/s or proposed building/s;

(b) The existing ground levels to Australian Height Datum around the perimeter of the building and contours of the site; and

(c) The existing or proposed floor levels to Australian Height Datum.

Noted, the required information will be provided in the subsequent DA.

***D7.4** Applications for earthworks, filling of land and subdivision shall be accompanied by a survey plan (with a contour interval of 0.5m) showing relative levels to Australian Height Datum.*

Noted, the required information will be provided in the subsequent DA.

***D7.5** For large scale developments, or developments in critical situations, particularly where an existing catchment based flood study is not available, a flood study using a fully dynamic one or two dimensional computer model may be required. For smaller developments the existing flood study may be used if available and suitable (eg it contains sufficient local detail), or otherwise a flood study prepared in a manner consistent with the "Australian Rainfall and Runoff" publication, any relevant Council Drainage Design Code and the Floodplain Development Manual, will be required. From this study, the following information shall be submitted in plan form:*

(a) water surface contours (including the 100 year flood and PMF extents)

(b) velocity vectors;

(c) velocity and depth produce contours;

(d) delineation of Flood Management Areas relevant to individual floodplains; and

(e) show both existing and proposed flood profiles for the full range of events for total development including all structures and works (such as revegetation /enhancements).

This information is required for the predeveloped and post-developed scenarios.

The Planning Proposal has taken into account the Grafton & Lower Clarence Floodplain Risk Management Plan 2007 (G&LCFRMP) which includes specific requirements for the Palmers Island Area and Caravan Parks. The G&LCFRMP was development by Bewsher Consulting Pty Ltd and is consistent with the NSW Flood Prone Land Policy and the principles of the *Floodplain Development Manual 2005*. Refer to Ministerial Direction 4.3 Flood Prone Land.

D7.6 *Where the controls for a particular development proposal require an assessment of structural soundness during potential floods, the following impacts must be addressed:*

(a) hydrostatic pressure;

(b) hydrodynamic pressure;

(c) impact of debris; and

(d) buoyancy forces. Foundations need to be included in the structural analysis.

Noted, the required information will be provided in the subsequent DA.

Palmers Island Riverbank Management Plan

The Planning Proposal involves land within the 100 year impact line under the Palmers Island Riverbank Management Plan 1995 (PIRMP). The PIRMP has since been incorporated into the Clarence Valley Council Rural Zones DCP Part P Palmers Island Riverbank Controls. The land within the 100 year impacts line is known as Precinct 2 in the DCP.

A E3 Environmental Management Zone is proposed across all riparian areas on site including all the land within the immediate management line to protect the biodiversity values. This zoning will ensure the habitat and ecological communities are managed in the long tern in accordance with the aims and objectives of the E3 Environmental Management Zone.

The following is an assessment of the relevant controls from Part P Palmers Island River Bank Controls of the Development in Rural Zones DCP.

P6.1. *Development within this Precinct 2 will be considered on the understanding that any consent granted will be subject to the provision that should the riverbank come within 18 metres of any building then the development consent will cease.*

Comment: This is understood by the applicant.

P6.2. *If the development consent does cease then the owner of the land will be responsible for the removal of any or all buildings from the site at the owner's expense, or where possible, to a location on the site further than 18 metres from the riverbank.*

Comment: This is understood by the applicant.

P6.3. *Prior to lodging an application with Council, the developer of the land must determine whether buildings are to be relocated or demolished, should the consent cease.*

Comment: Noted

P6.4. *Notwithstanding the above, all Class 1 residential buildings (dwelling-houses) must be relocatable and able to meet the conditions listed below. Extensions to existing dwellings may also be required to be demountable, taking into consideration the additional floor space proposed and the likely effect of the extension on the ability of the building to be relocated in case of an emergency.*

Comment: No dwelling houses are proposed as part of the park. However the existing dwelling on site will be used as the managers residence for the proposed caravan park. Extensions to the existing dwelling will comply with this requirement.

The following conditions will be imposed due to the possibility of riverbank erosion adversely affecting dwellings within the next 100 years.

1. The dwelling-house will be designed and constructed so that it can be easily removed from the site by road vehicle. The plans of the building will include an adequate description of the removal process.

Comment: No dwelling houses will be proposed as part of the caravan park, however the cabins within Precinct 2 will be constructed to be easily removed form the site by road vehicle.

2. Further to subclause (1), at the time of submission of a building application, a certificate is to be provided from a practicing structural engineer as to the adequacy of this building to be easily dismounted and readily removed from the site by road vehicle.

Comment: Noted.

3. The dwelling shall be located so as to maximise as far as practicable the distance from the nearest point of the building to the riverside boundary of the site with due consideration given to subclause (a) above and to any relevant local government building regulations.

Comment: The major appeal for this rural caravan park is its proximity to the Clarence River. With this in mind the design of the park has taken both the benefit from the river and also the risk from river bank erosion into account when designing the park layout. The cabin sites are located in an area which allows easy removal as they have direct access to River Road. This is a suitable balance between safety from river bank erosion and orderly and economic development of the site.

4. Subsequent to any approval being given for a relocatable dwelling, no works shall be carried out on the property which might hinder the ready relocation of the building. Such works might include the construction of wall, fences, screens, enclosures, brick veneering, landscaping or the fixing of joints or structural members by welding or other means.

Comment: A road network is included as part of the caravan park proposal, this will ensure vehicle access to all built structures are maintained and can be removed easily. Garden beds will be proposed as part of the caravan park but these will not present any barrier to relocated built elements if required by river bank erosion.

5. A restriction as to user will be placed on the title pursuant to the provision of section 88B of the Conveyancing Act 1919, stating: The subject land and any improvements erected thereon shall not be used for the purpose of (land use) in the event that the riverbank, as defined by Maclean Shire Council from time to time, comes to within 18 metres of any building or any part thereof at any time erected on the said land.

Comment: Noted and accepted by the Applicant.

6. This development consent shall cease if at any time the riverbank, as defined by Council comes to within 18 metres of any building associated with this development. The buildings shall then be removed by the owner of the land at the owner's expense.

Comment: Noted and accepted by the Applicant.

As shown above, the proposed rural caravan park can easily comply with the Clarence Valley Council Rural Zones DCP 2011 Part P Palmers Island Riverbank Controls and the Palmers Island Riverbank Management Plan 1995.

While the Planning Proposal is seeking a rezoning to allow built works within Precinct 2 (100 Year Management Line) adequate design elements and building styles can be employed to ensure all buildings can be easily be relocated in the event of erosion threatening the park in the next 100 years.

2.3.9 How has the planning proposal adequately addressed any social and economic effects

As outlined in Section 2.3.1 there is considerable demand for affordable accommodation within the Mid North Coast. If affordable and suitable caravan and camping accommodation is supplied, it is anticipated a national increase in consumption for the period 2011 to 2020 to increase by 1.5% annually to 45 million visitor nights.

The planning proposal allows for a rural caravan park which is privately funded and will provide the quality and affordable rural tourist accommodation the Towards 2020 NSW Tourism Masterplan has identified is in high demand from the domestic tourist market.

The planning proposal allows for a rural caravan park which will fill the void in the affordability market as outlined above. The park will provide affordable accommodation aimed at the domestic market, thus catering for the predicted increase in demand for this type of tourist accommodation by 2020.

The Region of the Mid North Coast is an area of with high demand for affordable tourist accommodation. With the caravan and camping style tourism being the fastest growing sector in Australia. This is further magnified by the imminent closure of large caravan park in the area (Blue Dolphin, Yamba). The extra demand created by the closure of the Blue Dolphin Caravan Park and other parks in recent years creates a local opportunity to capture the domestic traveller looking for this type of tourist accommodation. A significant economic benefit will be created with the employment opportunities created during construction and on-going operation of a caravan park.

The land has been significantly altered through past practices, no Aboriginal heritage is likely to be affected as part of this Planning Proposal. Further consultation with the Yaegl Local Aboriginal Land Council is proposed prior to further public consultation.

2.3.10 (Section D) Is there adequate public infrastructure for the planning proposal

The Region is provided with good quality public infrastructure within the towns of Palmers Island, MacLean, Yamba all having good quality road networks, sewer, water, telephone and electricity. The site will only require connections to town water and electricity, and telephone which are all currently available to the site. The existing road network within the Region is of a high standard which will adequately cater for tourist entering and moving about the Region.

2.3.11 What are the views of State and Commonwealth public authorities consulted in accordance with the gateway determination

During the preparation of this Planning Proposal a number of stakeholders were consolidated with the details and outcome details below the listed authority:

- **NSW Department of Primary Industries**, Melissa Kahler of the DPI was contacted about this Planning Proposal with regards to the zoning of Regionally Significant Farmland RU2 Rural Landscape. Mellissa responded saying the DPI does not normally comment on indicative proposals and the DPI will provide further comments after the Gateway Determination.

- **NSW State Emergency Service**, Michael Stubbs of the SES was contacted about this Planning Proposal with regards flooding and evacuation. Michael provided recorded flood heights data for the Clarence River and assisted in the preparation of evacuation times. This information has been included into the Flooding and Evacuation reporting attached at **Annexure G.**

The SES will also provide further comments on the flooding and evacuation procedures post Gateway Determination.

- **NSW Sugar Milling Co-Operative Limited**, Simon Hollis of the NSW Sugar Milling Co-operative Limited was contacted about this Planning Proposal with regards to the zoning of a small amount of previously used cane land to RU2 Rural Landscape. Simon provided a letter confirming PRIDEL P/L has a Production Area Entitlement of 47.3 hectares of sugar cane which is currently provided for. This letter is attached at **Annexure G.** The area of land proposed to be zoned RU2 Rural Landscape has not been used for cane production for some time and the owner of this land is cultivating the maximum amounts of cane land allowable under the Production Area Entitlement without the use of the subject 1.6 ha proposed to be rezoned.

- **NSW Department of Planning**, Carlie Boyd of the NSW Department of Planning has been the main contact along with Jim Clark. Advice has been sought about many aspect of the Planning Proposal with the majority of the consultation centred on the main issues of Flooding & Evacuation and Change of Zoning within Regionally Significant Farmland.

- **Clarence Valley Council,** Scott Lenton of Clarence Valley Council has been the main contact along with David Morrison. Advice has been sought about many aspect of the Planning Proposal with the majority of the consultation centred on the main issues of Flooding & Evacuation, Section 117 Directions and Strategic Support for the Proposal.

It is understood that with the approval of the Gateway Committee further consultation with the above stakeholders may be required along with but not limited to consultation with the following Stakeholders:

- **NSW Road and Maritime Services**, regarding possible intersection and road upgrades,
- **NSW Department of Primary Industries**, seeking further comments of the zoning of Regionally Significant Farmland RU2 Rural Landscape, and
- **NSW Office of Environment and Heritage**, regarding the classification of the neighbouring land as a Heritage Item as that area has historical value as the site of the original Palmers Island village and school. Consultation will also be sort on the Environmental zoning of the riparian land to E3 Environmental Management.

2.4 Community Consultation

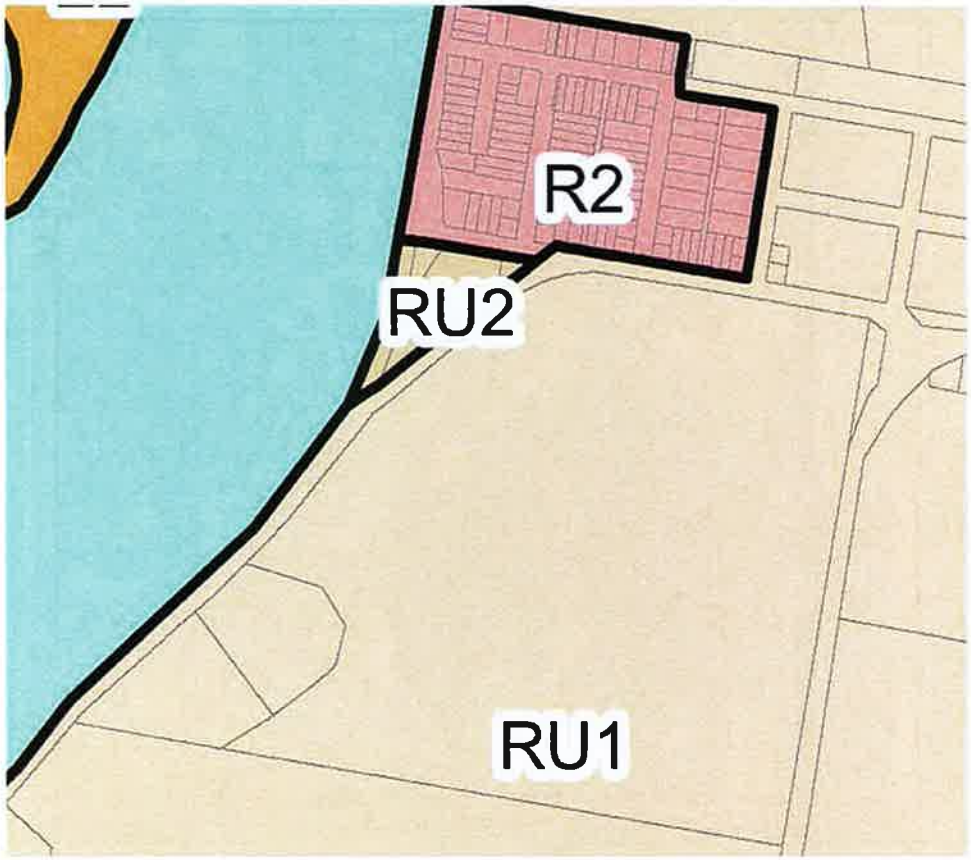
This Planning Proposal has outlined the proposed amendment to the Clarence Valley Local Environmental Plan 2011 to allow for the relocation of the Shady Nook Caravan Park away from the bank of the Clarence River and out of the Immediate Management Line.

This proposal is considered a minor amendment and is in accordance with the Mid North Coast Regional Strategy. Very little impacts are foreseen as a result of this amendment, however it is anticipated that this Planning Proposal will require public exhibition.

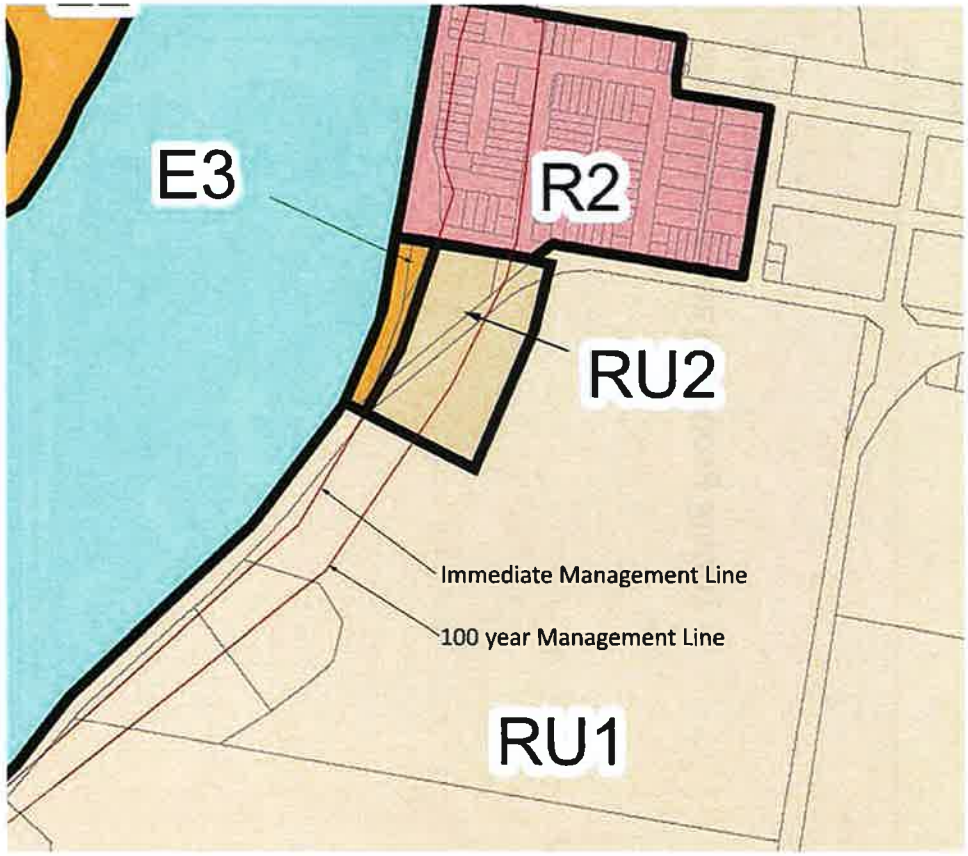
Prior to the lodgement of this Planning Proposal NSW Sugar Milling Co-Operative Limited were consulted over the loss of cane land with their support gained as outlined in the documentation attached at **Annexure H.**

After the Gateway Determination but prior to the Community Consultation the Yaegl Local Aboriginal Land Council will be consulted on the Planning Proposal.

Annexure A
Zoning Proposed and Existing Plan



Existing Zoning Plan -
Clarence Valley Local Environmental Plan 2011



Proposed Zoning Plan -
Clarence Valley Local Environmental Plan 2011

Annexure B
Details of the Existing Caravan Park

the Clarence Coast
maclean
shire

Reference: B01930
Contact: Chrys Warren

29th November 2002

Mr J.H. Field
Solicitor & Attorney
P.O. Box 3113
DURAL NSW 2158

Council Chambers

50 River Street

Maclean

NSW 2463

l communications to:

he General Manager

PO Box 171

Maclean

NSW 2463

Dear Sir,

I refer to your correspondence of the 12th November 2002 and advise as follows:

1. The current "approval to operate" for the Shady Nook Caravan Park will expire in January 2007.
2. The total number of dwelling sites approved is 48.
3. The total number of long term sites approved is 18.
4. The total number of short term sites approved is 20.
5. The total number of camp sites approved is 10.
6. An inspection of the Shady Nook Caravan Park by Council's Building Surveyor on the 16th April 2002 did reveal some matters which required attention. A copy of this report is attached.
7. The Shady Nook Caravan Park is affected by Maclean Shire Council's Palmers Island Riverbank Erosion Development Control Plan, a copy of which is also enclosed for your information.

I do advise that Council staff carry out an annual inspection of all caravan parks within the Shire to check compliance with the Local Government (Caravan Parks, Camping Grounds and Moveable Dwellings) Regulation 1995.

If you have any enquiries concerning the above information please don't hesitate to contact Council's Strategic Planning and Environmental Services Department.

A fee of $40.00 does apply for this enquiry and it is requested that this be forwarded to Council at your earliest convenience.

Yours faithfully

CWarren

Chrys Warren
Coordinator of Development & Health

11.12.02 Met Paul Lead on site. Advised him that Amenities Block could be demolished & rebuilt (5x6, 7x 8/9) - of equivalent size. Is located in Precinct 2. Discussed with Greg Mashiah.
CW

02 6645 2266

02 6645 3552

email

an@msc.nsw.gov.au

H:\Spes\WARREN\LETTERS\2002\Shady Nook Caravan Park 2911.doc

Poly 03232

ON-SITE SEWAGE MANAGEMENT INSPECTION REPORT

Application No. 3287 Receipt No. GIS Key 1040
Approval to operate (Yes)/No Approval To Operate Issue Date
Number of Systems 1 Proposed Sewer No

J Blackwell Pty Ltd & E Blackwell Pty Ltd

OWNER DETAILS

Surname Initials Title Mr/Mrs/Ms/Miss
Phone No. Shady Nook Corgwan Pk
Postal Address Street 8 River Rd
Town Palmers Is Postcode 2463

Site Details
Lot/DP No 417/751338 House No
Street Amenities Block & Town other c/w trenches
No. of Bedrooms / persons Rental Property

SEWAGE MANAGEMENT FACILITY DETAILS

- ☑ Standard septic tank and trench
- ☐ Aerated septic system
- ☐ Septic tank and polishing pond
- ☐ Other
- ☐ Composting toilet
- ☐ Pump out

Method of disposal
- ☑ On-site trench disposal
- ☐ On-site aerated
- ☐ Other
- ☐ Pump out and disposal off-site
- ☐ Composting toilet / Greywater

Soil Type
- ☐ Gravel/sand
- ☐ Sandy loam
- ☐ Loam
- ☐ Clay loam
- ☐ Light clay
- ☐ Med/heavy clay

Use Residential / (Commercial) / Public
Water Supply (Town Water) / Tank / River / Bore / Other
Bore on property Yes/(No)
Approval to install Yes/No
Service date

PLUMBER DETAILS

Surname Initials Title Mr/Mrs/Ms/Miss
Street Town Postcode

Inspection Date 19-4-00
Next Inspection Due 19-4-01

RISK CLASSIFICATION LOW MEDIUM (HIGH)

BO 1930

69

Maclean Shire Council

STRATEGIC PLANNING & ENVIRONMENTAL SERVICES

COUNCIL CHAMBERS, 50 RIVER STREET, MACLEAN N.S.W. 2463
TELEPHONE (02) 6645 2266 FAX (02) 6645 3552
E-mail: maclean@msc.nsw.gov.au
Web Site: http://www.msc.nsw.gov.au
ABN: 68 393 113 596

GIS No: 1040
Contact: D Manners
Your Reference: B01930

All communication to be addressed to
The General Manager, P.O. Box 171, Maclean 2463

14th January 2002

Shadynook Caravan Park
8 River Road
PALMERS ISLAND NSW 2463

APPROVAL TO OPERATE ON-SITE SEWAGE MANAGEMENT SYSTEM

Dear Sir/Madam

In relation to the On-site Sewage Management System located at:
Lot No 417 DP No 751388, Amenities block, Shadynook Caravan park 8 River Road Palmers Island

An assessment of the sewage management system at the above property was carried out by Council's Environmental Officer on the 7/1/2002. Your sewage system has been classified as a high risk.

An approval to operate an on-site sewage management system **has been granted** subject to the following conditions:

The effluent disposal area shall be mowed on a regular basis to facilitate the evaporation of treated effluent.

The gutters on the amenities block are to be repaired / replaced to prevent rainwater from entering the effluent disposal area. The downwater pipe is to be connected to subsurface piping and redirected away from the effluent disposal area.

These conditions, along with the standard conditions attached, must be met in order to satisfy the requirements of the Local Government (Approvals) Sewage Management (Amendment) Regulation 1998.

This approval commences from the 7/1/2002, and expires on the 7/1/2003.

Your co-operation in complying with the required works and the standard conditions is requested and will prevent the need for any further action when council re-inspects the sewage system.

An invoice for the inspection cost is included with this letter.

If you would like further literature, advice or information on any sewage management issues, please contact me on 02 66452266.

Yours faithfully,

David Manners
Environmental Officer

Standard Conditions for Approval to Operate On-site sewage Management System

1. The system of sewage management must be operated in accordance with the performance standards set out in *Clause 47 of the Local Government (Approvals) Regulations 1999*. These performance standards are:
   a) the prevention of the spread of disease by micro-organisms,
   b) the prevention of the spread of foul odours,
   c) the prevention of contamination of water,
   d) the prevention of degradation of soil and vegetation,
   e) the discouragement of insects and vermin,
   f) ensuring that persons do not come into contact with untreated sewage or effluent (whether treated or not) in their ordinary activities on the premises concerned,
   g) the minimisation of any adverse impacts on the amenity of the premises and surrounding lands,
   h) if appropriate, provision for the re-use of resources (including nutrients, organic matter and water).

2. The sewage management facilities used in the operation of the system must be maintained in a sanitary condition and must be operated in accordance with the relevant requirements of the *Local Government (Approvals) Regulation 1999*, and other relevant operating specifications.

3. The system of sewage management must be operated in accordance with the relevant operating specifications and procedures for the component facilities, and so as to allow removal of treated sewage in a safe and sanitary manner *(Clause 47 (3) Local Government (Approvals) Regulation 1999).*

4. A sewage management facility used in the operation of the system must not discharge into any watercourse or onto any land other than its related effluent application area *(Clause 48 of the Local Government (Approvals) Regulation 1999).*

5. The conditions (if any) of any certificate of accreditation issued by the Director General of the Department of Health under this division in respect of the plans or designs for any components of the sewage management facilities must be complied with *(Clause 48 of the Local Government (Approvals) Regulation 1999).*

6. The person operating the system of sewage management must provide details of the way in which it is operated, and evidence of compliance with the relevant requirements of the Regulation and of the conditions of the approval, whenever the Council reasonably requires the person to do so *(Clause 48 of the Local Government (Approvals) Regulation 1999).*

7. It is a requirement of this approval that no alterations or amendments be made to any part of the on-site sewage management system without prior approval by the Council or other relevant authorities.

8. The Council may carry out an audit inspection of the sewage management system to determine compliance with conditions of approval.

SITE ASSESSMENT

Flood Potential
Land Application Area below: 1 IN 100yr YES/NO
Slope..level.....
Erosion Potential..-.....
Groundwater Depth..-.....
Buffer Distances
Permanent Water..40m.....
Other Water..-.....
Sensitive Environment..-.....
Boundary..10m.....
Premises..3m.....
Pool.....
Surrounding Vegetation.....

SEPTIC TANK

Tank Size.....Tank Condition.....
Last Desludge.....
Inspection Holes covered Adequately Yes/No
Odour Present Yes/No
Desludging Required Yes/No
Is Lid Above Ground Level Yes/No
Comments.....
.....

ABSORPTION AREA / TRANSPIRATION AREA

Where.....
Is the area parallel with the contours of the land Yes/No
Is the area fenced off Yes/No
Signs of pooling Yes/No
Dimensions of area .....
Vegetation cover.....
Excess Weeds / Shade.....
Comments.....
.....

PUMP OUT DETAILS

Is site accessible for effluent collection by tanker Yes/No
Is there a graduated dipstick provided in collection well Yes/No
Grease Trap cleaned Yes/No
Comments.....

POLISHING POND

Is the pond fenced off Yes/No
Is there sub-surface irrigation for the overflow effluent Yes/No
Comments.....

AERATED WASTEWATER TREATMENT SYSTEM (AWTS)

AWTS Model type.....

AWTS operational at time of assessment Yes/No

Is AWTS fitted with malfunction alarm Yes/No

Is there an Operators manual on-site Yes/No

Are irrigation lines clear Yes/No

Are there unauthorized fittings in the irrigation line Yes/No

Comments.....

.....

What activities is the irrigation area used for.....

.....

Is there any runoff from the irrigation area Yes/No

Comments.....

.....

Are any warning signs displayed in the irrigation area Yes/No

Comments.....

.....

No of Sprinklers.....Sprinkler Coverage (m^2).....

General Comments.....

.....

.....

.....

COMPOSTING TOILET / GREYWATER SYSTEM

Model Type.....

Is there a fixed instruction notice in a prominent position Yes/No

Is there adequate ventilation Yes/No

Any odours present Yes/No

Type of Greywater treatment.....

.....

Is the disposal area size adequate Yes/No

Comments.....

.....

.....

PLAN OF SITE

See Attached Sheet.

SUMMARY OF REPORT

ENVIRONMENTAL CONSTRAINTS (Water, Soil, Bushland etc)

.....

.....<...100m...to...permanent...waterway.....(Yes)/No.....

.....<...40m...to...other...waterway.....Yes/No.....

.....Below...1:100...flood...level.....(Yes)/No.....

.....

.....

.....

.....

HEALTH CONSTRAINTS

.....

.....

.....

.....

.....

.....

OTHER CONSTRAINTS

.....

.....

.....

.....

.....

COMMENTS

.....

.....Guttering to be repaired.....

.....Downpipe to be connect to.....

.....sub surface piping - diverted away.....

.....from it.....

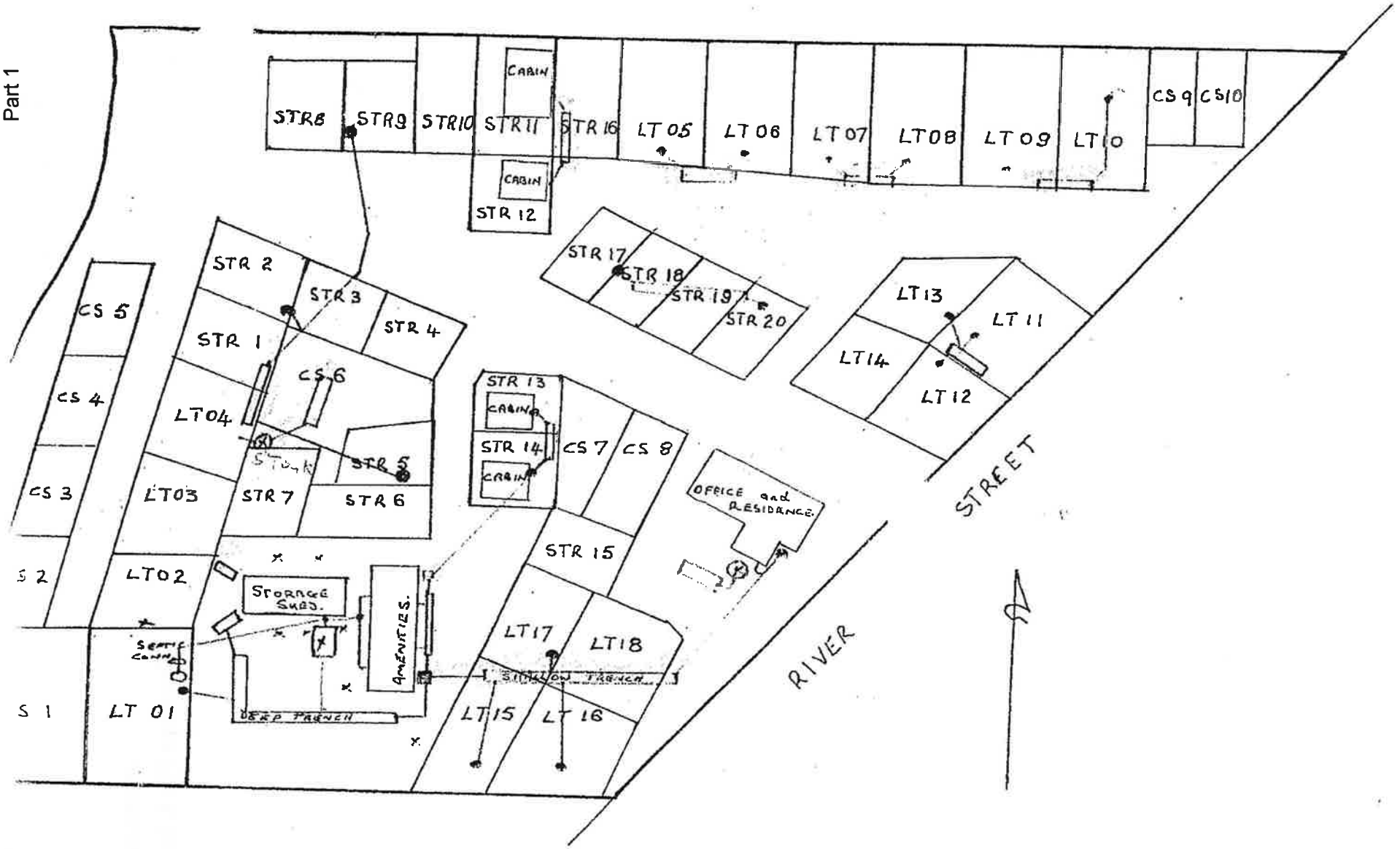
.....

RISK CLASSIFICATION

Low (5yrs)

Medium (3yrs)

high

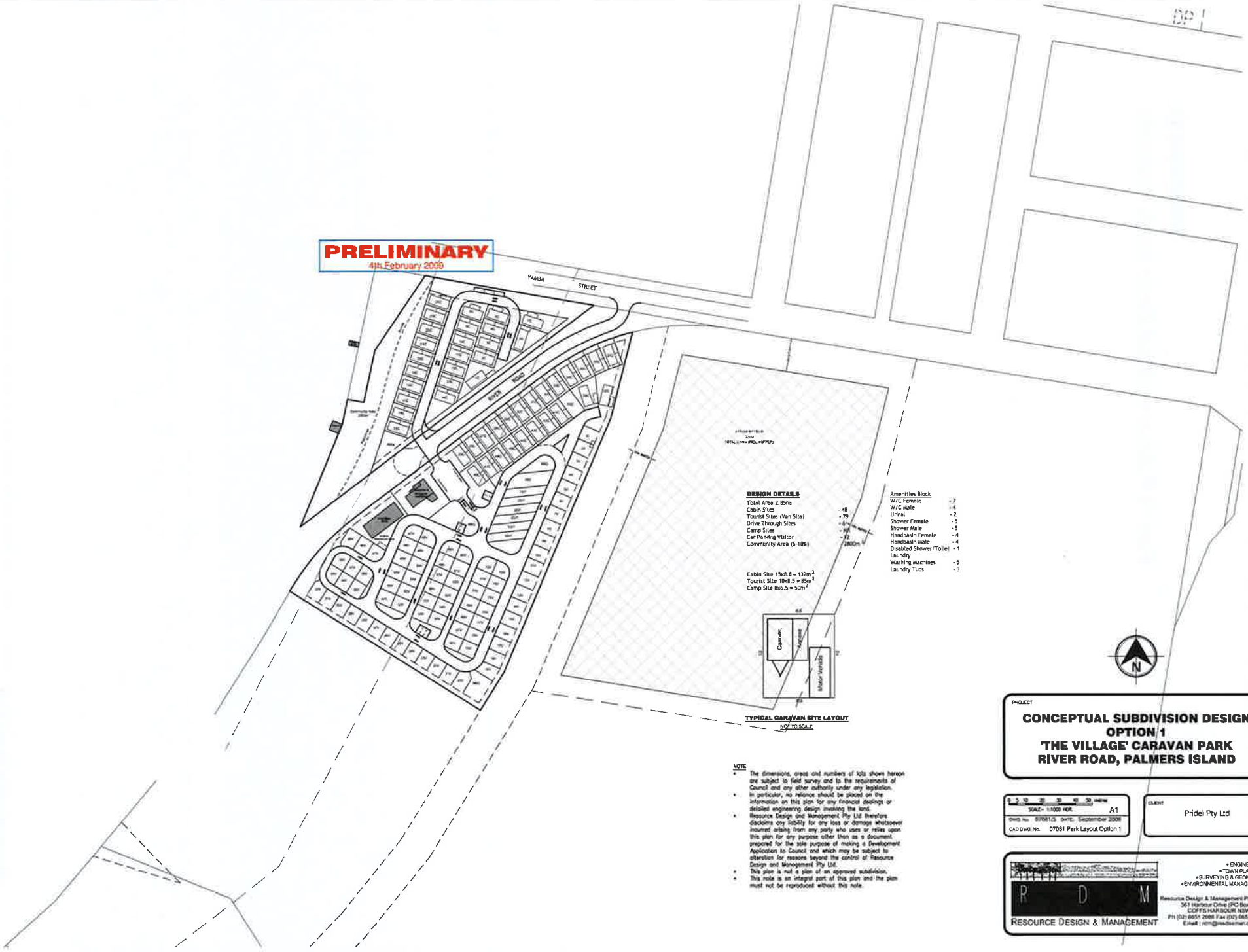


SHADY NOOK – PALMERS ISLAND.
SITES PLAN.

LT 01-18 LONG TERM RESIDENTS.
STR 1-20 SHORT TERM RESIDENTS.
CS 1-10 CAMP SITES.

Annexure C
Concept Park Design

PRELIMINARY
4th February 2009



DESIGN DETAILS

Total Area 2.85ha	
Cabin Sites	- 48
Tourist Sites (Van Site)	- 79
Drive Through Sites	- 6
Camp Sites	- 30
Car Parking Visitor	- 12
Community Area (6-10%)	1800m²

Cabin Site 15x8.8 = 132m²
Tourist Site 10x8.5 = 85m²
Camp Site 8x6.5 = 50m²

Amenities Block

W/C Female	- 7
W/C Male	- 4
Urinal	- 2
Shower Female	- 5
Shower Male	- 5
Handbasin Female	- 4
Handbasin Male	- 4
Disabled Shower/Toilet	- 1
Laundry	
Washing Machines	- 5
Laundry Tubs	- 3

TYPICAL CARAVAN SITE LAYOUT
NOT TO SCALE

NOTE

- The dimensions, areas and numbers of lots shown hereon are subject to field survey and to the requirements of Council and any other authority under any legislation.
- In particular, no reliance should be placed on the information on this plan for any financial dealings or detailed engineering design involving the land.
- Resource Design and Management Pty Ltd therefore disclaims any liability for any loss or damage whatsoever incurred arising from any party who uses or relies upon this plan for any purpose other than as a document prepared for the sole purpose of making a Development Application to Council and which may be subject to alteration for reasons beyond the control of Resource Design and Management Pty Ltd.
- This plan is not a plan of an approved subdivision.
- This note is an integral part of this plan and the plan must not be reproduced without this note.

PROJECT

CONCEPTUAL SUBDIVISION DESIGN OPTION 1 'THE VILLAGE' CARAVAN PARK RIVER ROAD, PALMERS ISLAND

SCALE= 1:1000 HOR. A1
DWG No. 07081.S DATE: September 2008
CAD DWG No. 07081 Park Layout Option 1

CLIENT
Pridel Pty Ltd

RESOURCE DESIGN & MANAGEMENT
• ENGINEERING
• TOWN PLANNING
• SURVEYING & GEOMATICS
• ENVIRONMENTAL MANAGEMENT
Resource Design & Management Pty. Ltd.
361 Harbour Drive (PO Box 1430)
COFFS HARBOUR NSW 2450
Ph (02) 6651 2088 Fax (02) 6651 3689
Email : rdm@resdesman.com.au

Annexure D
Part Q Palmers Island River Bank Controls

PART Q PALMERS ISLAND RIVERBANK CONTROLS

Q1. Where do Palmers Island Riverbank controls apply?

Controls for Palmers Island apply to land in the 1(a) Rural (Agricultural Protection) zone in Maclean LEP 2001 and affected by clause 15 of Maclean LEP 2001. See MAP Q1.

Q2. What are the aims of the controls for Palmers Island riverbank?

The aims of the controls for Palmers Island riverbank are:

(a) To make provision for the orderly and economic development of land within the erosion zone.
(b) To ensure that such development is carried out in a manner which does not adversely affect the riverbank erosion process and will not be adversely affected by riverbank erosion processes.
(c) To provide guidelines for the determination of development on lands subject to riverbank erosion.

Q3. Definitions

In this Part of the DCP,

Map means the map marked: 'Palmers Island Riverbank Erosion D.C.P – Land subject to riverbank erosion (Amendment No. 1).
The map is located at the end of this Part of the DCP. Map S1

Immediate Management Line means the line shown on the map marking the extent of land considered to be under immediate threat from riverbank erosion.

100 year Management Line means the line shown on the map indicating that the land on the river side of that line may come under threat from riverbank erosion within 100 years.

Q4. Controls for Precinct 1

Q4.1. No buildings or works are permitted within Precinct 1 other than fencing and rebuilding, in line with the following requirements.

Precinct 1 means that area between the river bank and the immediate management line.

Q4.2. Rebuilding

1. Where an existing building is totally destroyed through accident or damage caused by processes other than riverbank erosion, no rebuilding will be allowed. This is to ensure that a new building is not erected in the area at highest risk of riverbank slip.

2. Where an existing building is partially destroyed through accident or damage caused by processes other than riverbank erosion, it is preferred that the building be demolished. However, where no building or development approval is required, the building may be repaired so that:

   (a) the total floor area of the rebuilt or repaired building is not greater than the total floor area before the damage occurred;

   (b) the repairs or rebuilding have no detrimental effect on the ability of the building to be relocated in an emergency; and

   (c) the repairs or rebuilding are effected within 12 months of the date when the damage occurred.

PART Q PALMERS ISLAND RIVERBANK CONTROLS

Q5. Controls for Precinct 2

Precinct 2 means that area between the immediate management line and the 100 year management line.

Q5.1. Development within this Precinct 2 will be considered on the understanding that any consent granted will be subject to the provision that should the riverbank come within 18 metres of any building then the development consent will cease.

Q5.2. If the development consent does cease then the owner of the land will be responsible for the removal of any or all buildings from the site at the owner's expense, or where possible, to a location on the site further than 18 metres from the riverbank.

Q5.3. Prior to lodging an application with Council, the developer of the land must determine whether buildings are to be relocated or demolished, should the consent cease.

Q5.4. Notwithstanding the above, all Class 1 residential buildings (dwelling-houses) must be relocatable and able to meet the conditions listed below. Extensions to existing dwellings may also be required to be demountable, taking into consideration the additional floor space proposed and the likely effect of the extension on the ability of the building to be relocated in case of an emergency.

Q6 Conditions for Precinct 2

The following conditions will be imposed due to the possibility of riverbank erosion adversely affecting dwellings within the next 100 years.

1. The dwelling-house will be designed and constructed so that it can be easily removed from the site by road vehicle. The plans of the building will include an adequate description of the removal process.

2. Further to subclause (1), at the time of submission of a building application, a certificate is to be provided from a practising structural engineer as to the adequacy of this building to be easily dismounted and readily removed from the site by road vehicle.

3. The dwelling shall be located so as to maximise as far as practicable the distance from the nearest point of the building to the riverside boundary of the site with due consideration given to subclause (a) above and to any relevant local government building regulations.

4. Subsequent to any approval being given for a relocatable dwelling, no works shall be carried out on the property which might hinder the ready relocation of the building. Such works might include the construction of wall, fences, screens, enclosures, brick veneering, landscaping or the fixing of joints or structural members by welding or other means.

5. A restriction as to user will be placed on the title pursuant to the provision of section 88B of the Conveyancing Act 1919, stating:

   The subject land and any improvements erected thereon shall not be used for the purpose of (land use) in the event that the riverbank, as defined by Maclean Shire Council from time to time, comes to within 18 metres of any building or any part thereof at any time erected on the said land.

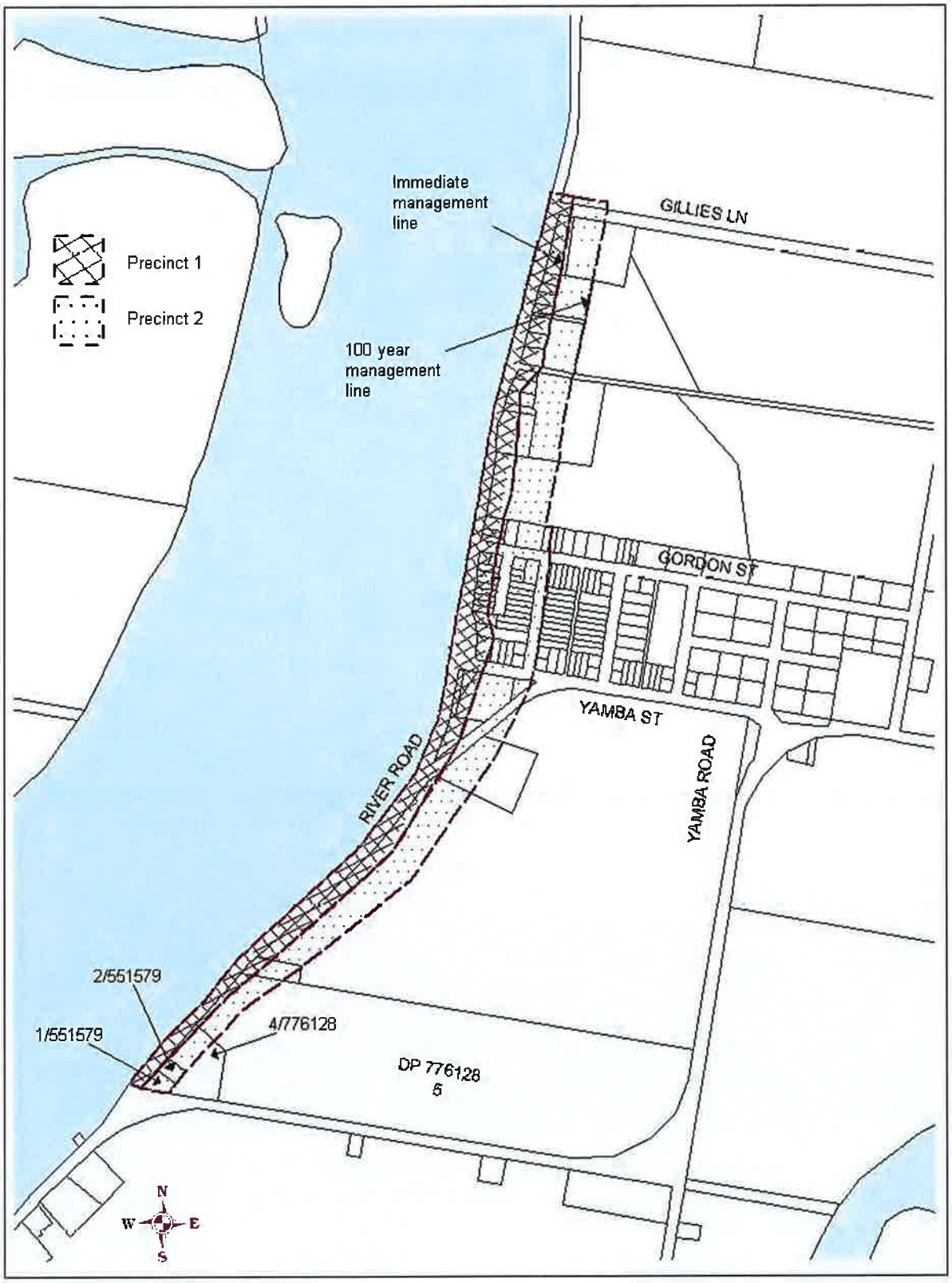
6. This development consent shall cease if at any time the riverbank, as defined by Council comes to within 18 metres of any building associated with this development. The buildings shall then be removed by the owner of the land at the owner's expense.

Q7. Servicing

The provision of vehicular access, water, electricity, telephone and other services will be considered on the merits of each case. In principle, all services should be provided from the landward side of the development such that the building is between the services and the riverbank.

PART Q PALMERS ISLAND RIVERBANK CONTROLS

MAP Q1



Annexure E
Detailed Site Investigations

This Annexure is submitted as a separate report

Detailed site investigation of 19 River Road, Palmers Island, New South Wales.

Report No 50212

Report to Mr Paul Reid

February 2003

Environmental & Earth Sciences Pty Ltd

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ACN 002 347 971
Environmental & Earth Sciences Pty Ltd
Contaminant Soil Science & Hydrogeology

5 February 2003

Mr Paul Reid
19 River Road
Palmers Island NSW 2463

Attention: Mr Paul Reid

Dear Paul

Re: Detailed site investigation of 19 River Road, Palmers Island, NSW

Environmental & Earth Sciences Pty Ltd are pleased to present two copies of our report *Detailed site investigation of 19 River Road, Palmers Island, NSW.*

Since at least 1966 the site has been used for the cultivation of sugar cane. Soil samples analysed for organic compounds found trace concentrations of dieldrin, well below guideline levels, in several surface samples. All other samples analysed for organochlorine pesticides and total petroleum hydrocarbons contained non detectable concentration. All samples analysed for heavy metals are considered to be representative of background concentrations and did not exceed relevant guideline levels.

Based upon the findings of this investigation, with regard to soil and groundwater contamination from organochlorine pesticides (OCP), total petroleum hydrocarbons (TPH) and heavy metals, the site can be considered as suitable for the proposed residential subdivision.

Thank you for the opportunity to undertake this study. Should you have any further questions regarding the report please do not hesitate to call the undersigned on (02) 6687 4650.

Yours sincerely
Environmental & Earth Sciences Pty Ltd

pp. Hugh McCaffery
Soil Scientist

rep02/50212.doc

Internal Auditor
Andrew Kohlrusch
NSW State Manager

Phone: (02) 9922 1777
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TABLE OF CONTENTS

1.0 INTRODUCTION

Environmental & Earth Sciences Pty Ltd were commissioned by Mr Paul Reid to undertake a detailed site investigation (DSI) of 19 River Road, Palmers Island, New South Wales. The study area is the river frontage of a 33.6 hectare sugar cane farm. This area, approximately 9.9 hectares, comprised sugar cane fields, a house and shed where residential allotments are proposed.

As the site consists of land used for sugar cane farming, there is a potential for contamination from herbicides and pesticides associated with agricultural cultivation. An investigation was undertaken of the soil, at and below the site surface, to determine the potential for offsite migration of contaminants and to identify areas of gross contamination.

A historical investigation, soil sampling and laboratory analyses were performed as part of this study. Professional judgement was used to extrapolate between inspected areas and sampling locations, however even under ideal circumstances actual conditions may vary from those inferred to exist. The actual interface between materials and variation of soil quality may be more abrupt or gradual than the report indicates.

Environmental & Earth Sciences Pty Ltd is not responsible for variations due to alterations of site conditions or chemistry since the time of inspection, for example through illegal dumping.

The inspection was undertaken in accordance with a Stage 2 environmental site investigation, which is stated in the NSW EPA (1997) *Contaminated sites: guidelines for consultants reporting on contaminated sites* (Reference 8).

This report has been produced in accordance with an agreed scope of work (Environmental & Earth Sciences' proposal PO50227 dated 14 November 2002) for, and is the property of, Mr Paul Reid. The investigation was conducted as per written confirmation to conduct the work from Mr Paul Reid received 26 November 2002.

2.0 OBJECTIVES

It is understood that the 9.9 hectare study area, where residential allotments are proposed, requires an environmental assessment as a guide to the risk of liability for any potential contaminated site remediation. The objective of this report was to assess the potential for previous and/or current site activities to have impacted the site soils and/or groundwater.

The aim was achieved through undertaking an historical investigation, site inspection, field sampling and laboratory soil analysis in order to estimate the area and extent of possible contamination caused by site activities past or present. The work undertaken to achieve the above objective is presented in the following sections.

3.0 SITE CHARACTERISTICS

3.1 Location and property description

The site is located along River Road, Palmers Island, local government area of Maclean Shire Council, New South Wales. The study area, covering approximately 9.9 hectares, is located on the banks of the Clarence River, the western portion of the 33.6 hectare property. The study area is nearly level, has a westerly aspect and is bisected by a shallow drain and access track that runs east west. For the purposes of legal identification the property is known as Lot 2 DP 186236, Lot 22 DP 632 068, Lot 35 DP 661175, in the County of Clarence, Parish of Taloumbi, New South Wales.

The regional location of the site is shown in Figure 1.

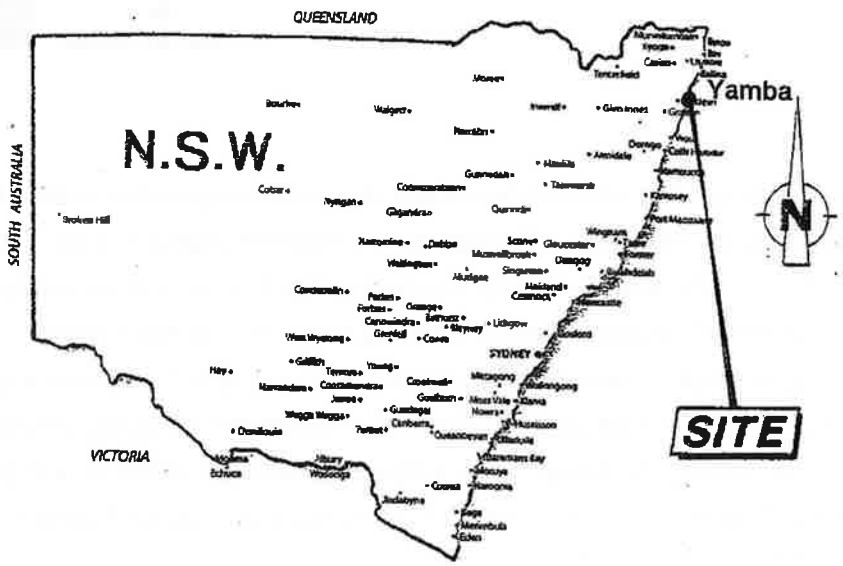
3.2 Geology, hydrogeology, topography and soil

The local geology of the property has been described in the Woodburn 1:100 000 *Geological series sheet 9539* (Reference 3) as Quarternary aged undifferentiated alluvial plain consisting of sand, silt, clay and gravel deposits that includes beach, levee and back swamp deposits, point bars, overbank and some residual and colluvial deposits.

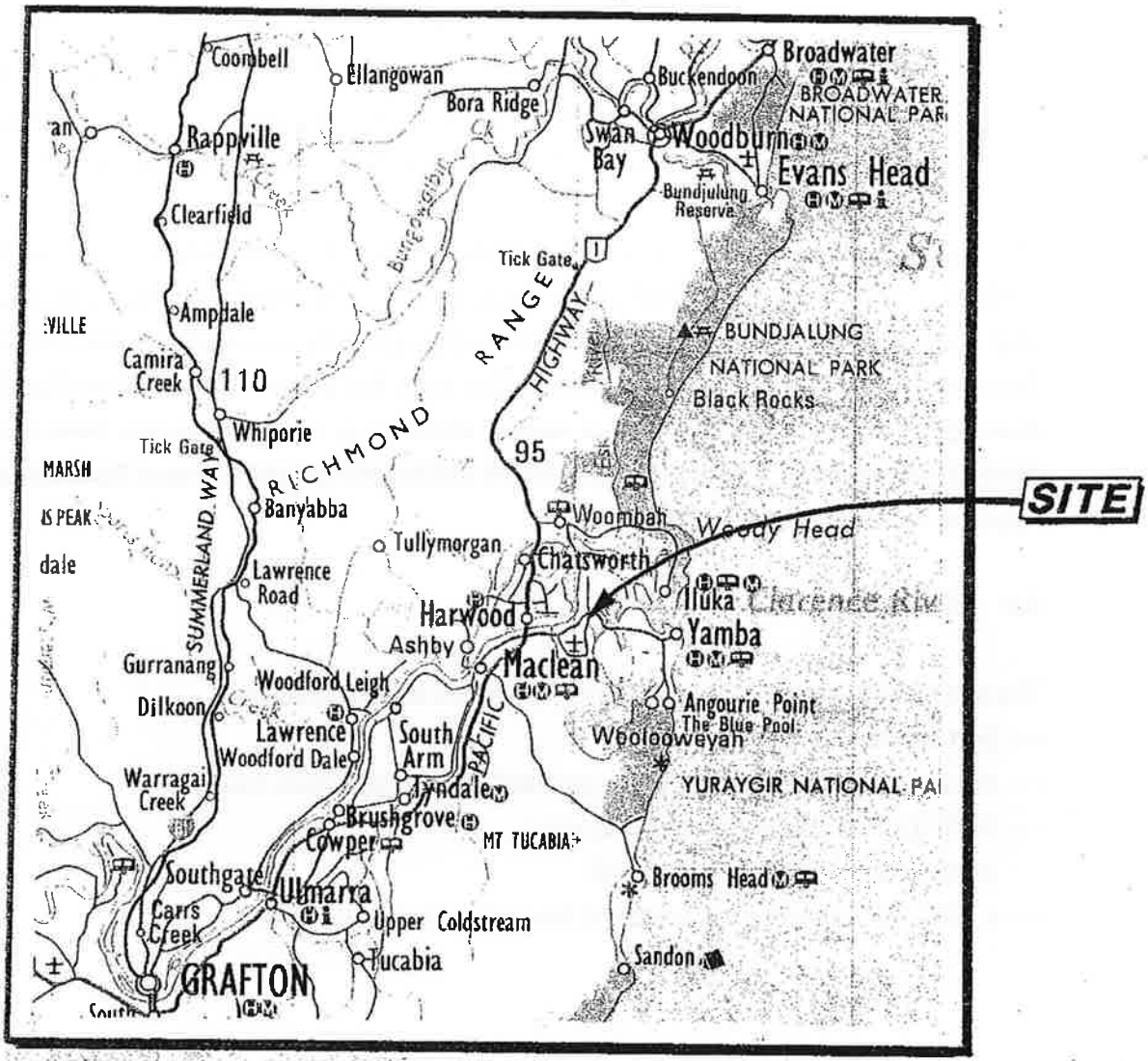
These Quarternary deposits are underlain by Triassic-Jurassic Ripley Road sandstone, Triassic Evans Head coal measures and the Silurian Neranliegh-Fernvale Group which comprises greywacke, slate, phyllite and quartzite (Reference 3).

The topography of the region in the vicinity of the site comprises an extensive (10 000 to 15 000 metre wide) level to very gently inclined deltaic plain. Elevation ranges from one to three metres above mean sea level. Slopes are generally 0 to 3 percent. The landscape is distinguished by numerous channels, creating an island network within the estuary. On Palmers Island, the migrating Micalo Channel/Oyster Channel drainage system has exploited the alluvium-sand mass boundary and consequent erosion has brought marine sediments close to the surface (Reference 6).

The soils observed on this site are topographically related to and incorporate soils classified in the *Soil Landscapes of the Woodburn 1:100 000 series sheet* report (Reference 6) as belonging to the Palmers Island soil landscape. A soil landscape is an area of land that has recognisable and specifiable topographies and soils.



Site Location: YAMBA, NSW



Client:	Mr. P Reid		
Title: Locality Plan		Drawn: TJ	Fig. 1
Location: 19 River Road, Palmers Island, NSW		Project Manager: HMc	
		Approved:	Date: Jan.03

Job No. 50212 Date drawn: 13/01/03

The Palmers Island soil landscape is a combination of alluvium overlying marine sediments, a pattern that varies little across the landscape, although the thickness of alluvium does. The soils generally consist of 10 to 50 millimetres deep, brown structured alluvial clays overlying brown massive clays 20 to 50 millimetres in depth. These alluvial clays of the A and B horizon are underlain by grey clayey sands with distinct orange mottling and saturated grey clayey sands containing potential acid sulfate soil. Generally, these soils are poorly drained, presenting a localised flood hazard, are strongly acid, sodic/dispersive and erodable with low wet bearing strength at field capacity. Subsoils are are hardsetting with high acid sulfate potential and low permiability (Reference 6).

3.3 Vegetation and drainage

Most of the original vegetation in this region has been extensively cleared, and replaced by sugar cane cultivation. *Setaria* sp. dominate grazing areas not used for sugar cane. *Casuarina glauca* (swamp oak) forms isolated stands throughout the landscape (Reference 6).

Drainage in the region is alluvial, slowly migrating, reticulated and integrated and has been modified by a network of artificial drains (Reference 6). The Yamba 1:25 000 topographic map shows that run-off from the site migrates topographically in a southerly and northerly direction to a shallow east /west oriented surface drain that bisects the site. Runoff and drainage from this drain migrates in an easterly direction to another drain that flows in a north easterly direction into Romiaka Channel which discharges into the Clarence River Estuary opposite the Iluka township (Reference 12).

3.4 Site history

The site history was gained by reviewing the following information:

— past aerial photographs;
— the section 149 zoning certificate provided by Maclean Shire Council;
— NSW DLWC acid sulfate soil risk map;
— groundwater bore data search; and
— a NSW EPA search from Land and Property Information NSW.

3.4.1 Aerial photograph investigation

As part of the historical survey, four aerial photographs of the area were studied from the period 1966 to 1998. A list of the photographs used in this study is presented in Table 1.

TABLE 1

AERIAL PHOTOGRAPHS

Year	Run	Map No	Series
1966	4M	1442	Woodburn
1971	7	1956	Woodburn
1989	7	3654	Woodburn
1998	12	4450	Woodburn

The 1966 aerial photograph showed the Clarence River flowed in a south north direction adjacent to the western boundary of the site. The site was extensively cleared of native vegetation, having been replaced by sugar cane cultivation. A shallow drain with an east west orientation bisected the site, connected to a larger drainage network to the east.

A house and shed was located on the western boundary, on the northern side of the shallow drain. A house and several sheds were located on the southwestern boundary. The site was surrounded by sugar cane cultivation on Palmers Island and across the Clarence River.

Two buildings were located across River Road, adjacent to the northwestern boundary of the site, on the Clarence River frontage. Four houses were located on the northern side of a paddock, north of Yamba Road. Numerous houses and sheds were observed north and south of the site along the river frontage.

The 1971 aerial photograph showed no change on the site and only minor changes regionally from the 1966 photograph. Several cabins had been erected on the land adjacent to the northwestern boundary of the site, on the Clarence River frontage. Six houses were now located on the northern side of the paddock, north of Yamba Road. A large, cleared area of bare soil could be observed on the opposite bank of the Clarence River, south west of the site.

The 1989 photograph indicated that the house and shed located on the western boundary, on the northern side of the shallow drain remained. A house and shed had been erected on the

northwestern boundary of the site. Two sheds north of the house located on the southwestern boundary had been removed.

The site's landuse was still dominated by sugar cane cultivation. Onsite drains were similar in orientation and shape to previous aerial photographs, although they had been straightened and made regular in shape.

More cabins had been erected on the land adjacent to the north western boundary of the site, on the Clarence River frontage. Several large additional trees could also be observed on this land. Numerous houses were now located around the paddock, north of Yamba Road. Several large sheds had been constructed on the large, cleared area on the opposite bank of the Clarence River, south west of the site, observed in the 1971 photograph.

Areas to the east, southeast and west of the investigation area appeared to have been converted to pasture consistent with cattle grazing.

No changes had occurred to the investigation site between 1989 and 1998, excepting that the house and shed located on the western boundary, on the northern side of the shallow drain had been removed. More large trees could also be observed on the land adjacent to the north western boundary of the site, on the Clarence River frontage. Numerous houses were located around the paddock, north of Yamba Road.

In summary, the site was used for sugar cane cultivation from between 1966 and 1998. A house and shed had been erected on the northwestern boundary of the site between 1971 and 1989. A house and shed located on the western boundary, on the northern side of the shallow drain had been removed between 1989 and 1998.

3.4.2 Review of environmental planning certificate

An application was made to Maclean Shire Council for the provisions of a Section 149 certificate to the Environmental Planning & Assessment Act 1979. Part (F)of the Certificate identifies the site as being flood liable and as being identified bushfire prone land. The site is also identified as potentially containing acid sulfate soils

Part (G) of the Certificate identified the site as not being subject to a current voluntary agreement, site audit statement, declaration, or order for investigation or remediation issue under the *Contaminated Land Management ACT 1997* as notified by the EPA.

3.4.3 Review of acid sulfate soil risk map

The Department of Land and Water Conservation (1997) Acid Sulfate Soil Risk Map of Yamba Sheet identifies the site as being within a high risk acid sulfate soil (ASS) Class where potential acid sufate soils can occur at a depth of between one and three metres (Reference 5).

3.4.4 Review of land and property information certificates

An Environment Protection Authority (NSW EPA) Unhealthy Building Land Act 1990 certificate for the site, was supplied by the client. No statutory notices have been issued under the provisions of either the Environmentally Hazardous Chemicals Act 1985 or the Unhealthy Building Land Act 1990 for the subject land.

3.4.5 Review of groundwater bore search

A groundwater bore search conducted by the Department of Land & Water Conservation found that six registered groundwater bores are located within a six kilometre radius of the site. These groundwater bores are privately owned and are used for domestic and stock purposes.

Two of the groundwater bores are located east of the project site, across Romiaka and Oyster Channels, in Yamba. No drillers logs, water bearing zone, standing water level or salinity data was supplied in the work summaries of these bores.

The other four groundwater bores were located south west of the project site. Groundwater bore GW301178 was approximately four kilometres southwest of the project site. The bore was drilled to a depth of 42 metres, had a standing water level of seven metres, a yield of 0.38 Litres per second (L/s) and its salinity was described as good. The geology of the borehole was described as topsoil to 0.3 metres, underlain by 5.7 metres of yellow clay to six metres, underlain by 36 metres of yellow to grey sandstone to 42 metres in depth. GW063628 and GW065734 were a further kilometre south west and south of GW301178 respectively. GW063628 was drilled to a depth of 37 metres through two metres of clay, underlain by 35 metres of sandstone and 19 metres of coal with salinity at 0-500ppm. GW301178 was 24 metres in depth, consisting of one metre topsoil underlain by 23 metres of sandstone with a standing water level of eleven metres and a yield of 1.14 L/s.

GW301181 was located approximately 5.8 kilometres south west of the site, was drilled to a depth of 33 metres, had a standing water level of 21 metres, a yield of 0.76 L/s, the water bearing zone was four metres thick and occurred at a depth of between 27 and 31 metres in cracky black shale. The geology of the borehole was described as topsoil to 0.3 metres, underlain by 2.7 metres of grey clay to six metres, underlain by 23 metres of grey mudstone, one metre of shale, four metres of cracky black shale and two metres of black shale to 33 metres in depth. The salinity of water yielded was described as good.

3.5 Potential for contamination

Following the study of historical information it was concluded that the potential for residual contamination of the site is restricted to sugar cane cultivation activities. The client indicated that dieldrin had not been used on the plantation for at least 20 years. As a consequence these soils have the potential to contain concentrations of organochlorine pesticides at the surface which may persist in the soil for a considerable amount of time.

Previous Environmental & Earth Sciences experience with former market garden and orchard sites has indicated consistently that while chlorinated hydrocarbons are present in the surface soil of such areas, concentrations are not a concern to site users and sediment migration is minimal to non-existent on minor slopes and/or stable soils such as those observed in this region.

It is unlikely that potential contamination from more recently used organophosphates and carbamates would be a problem, as they degrade quickly in the soil and residues are often undetectable within a year.

Contamination on agricultural land can be associated with intensive agriculture or animal treatment enclosures such as yards, dips and dairies. No evidence of infrastructure that would be associated with any dip site location was observed on aerial photographs of the site.

Where buildings, hard stands or dumps for surface and buried rubbish have been existent in the past, a minor potential exists for hydrocarbon and heavy metal contamination. The construction materials indicate a minor potential for localised heavy metals impact on site soils, usually as a result of runoff from galvanised iron roofing. No potential for hydrocarbon contamination could be detected from past activities as revealed in the aerial photographs. It is unlikely that residual organochlorine pesticides used as termiticides under any concrete slabs would be a problem, as concentrations in the soil are often minimal to non-detectable.

Minor soil redistribution has been undertaken on the property and at the time of the investigation there were small areas of mixed natural soil material around the shed, constructed in the north west of the site. As this material appeared to be natural soil material sourced from the site. Potential for contaminated material brought from offsite sources is low.

There was no evidence of imported fill material being used on the site, apart from the track that ran adjacent to the shallow drain that bisected the site. This track appeared to be derived from local soil material. Therefore the presence of chemicals, such as heavy metals, total petroleum hydrocarbons (TPH), organochlorine pesticides (OCPs), phenols and/or polycyclic aromatic hydrocarbons (PAHs), in such material is minimal.

In summary, potential contamination sources on Site were considered to be limited to organochlorine pesticides (OCPs) associated with sugar cane cultivation and localised metals around buildings. The site inspection will aim to further elucidate these potential sources of contamination.

4.0 FIELD INVESTIGATION

The field investigation was undertaken on 17 December 2002 and consisted of a site inspection utilising information gained in the historical survey and discussions with the owner Mr Paul Reid. Site features at the time of the investigation are presented in Figure 2.

4.1 Site inspection

At the time of the investigation, the study area comprised a cultivated field divided by a shallow drain oriented east west covered by a juvenile crop of soy beans and a house and shed in the north western corner. The site was approximately 9.9 hectares, part of a 33.6 hectare sugar cane farm and had a north south orientation.

A house with an attached garage and large galvanised iron machinery shed were located on the north western corner of the site. The house was constructed of brick and tile and was in good condition. The shed, used to store farm machinery and equipment, was constructed of galvanised iron and was in good condition. An above ground storage tank (AST), 4 000 litres in volume and used to store diesel fuel, was located outside the southern side of the shed. Minor oil staining was observed around the front of the AST. The shed was raised above ground level by what appeared to be locally derived fill material.

The investigation area was surrounded to the north, south and east by sugar cane plantations, while the western boundary consisted of River Road and the Clarence River. A house and shed were located adjacent to the south western corner of the site.

Vegetation throughout the site was noted to be healthy with no visible signs of stress. Trees and shrubs were scattered across the site, with remnant pockets of shrubs, trees and herbs occupying the north and north eastern sides of the house. Both native (such as eucalyptus and casuarina) and introduced species (such as camphor laurel and privet) were present.

No drums, wastes, imported fill materials or unusual odours were observed or smelt within the investigation area. The site is adjacent to the Clarence River, no other locally sensitive environments such wetlands or faunal habitat was observed within or close to the investigation area. No surficial rubbish was observed on site.

Drainage across the site would migrate topographically in a southerly and northerly direction towards the shallow drain that bisected the site.

Although there was evidence of fill material on site, this appeared to be locally derived natural soil material that had been used to level the area on which the plantations' machinery shed was located. A small access track next to the shallow drain that bisected the site was consolidated by what appeared to be locally derived natural soil material.

4.2 Sampling locations

A total of 107 surface soil sampling (SS2 to SS107) and three borehole locations (BH1, BH53 and BH106) were sampled across the site (Figure 2). Sampling design was based on NSW EPA's *Contaminated sites: sampling design guidelines* (1995) and was conducted using a grid basis. In addition, judgemental sample selection, based upon the location of potential contamination sources (e.g. above ground storage tanks and drains), was also undertaken.

Samples were collected using surface soil sampling techniques. During the inspection, soil description, texture and pH were recorded at each sampling location and are presented in Appendix A of this report. Sampling techniques conform with Environmental & Earth Sciences' *Soil, gas and groundwater sampling manual* and the quality assurance and quality control (QA/QC) procedures outlined in Appendix C of this report.

Due to the large number of samples collected, soil samples were composited to allow economical laboratory analysis. Four individual soil samples were used to form each composite. Soils used to make each composite set all contained similar textural characteristics and were taken from the same soil horizon. Composited samples are listed in Table 2. The sampling procedure conformed to the NSW EPA's *Contaminated sites: sampling design guidelines* (1995).

TABLE 2

COMPOSITED SAMPLES

CS1	CS2	CS3	CS4	CS5
BH1 (0-0.1m)	SS2	SS3	SS4	SS5
SS10	SS9	SS8	SS7	SS6
SS11	SS12	SS13	SS14	SS15
SS20	SS19	SS18	SS17	SS16
CS6	**CS7**	**CS8**	**CS9**	**CS10**
SS21	SS23	SS25	SS31	SS32
SS22	SS24	SS26	SS40	SS39
SS29	SS27	SS35	SS41	SS42
SS30	SS28	SS36	SS50	SS49
CS11	**CS12**	**CS13**	**CS14**	**CS15**
SS33	SS34	SS46	SS60	SS59
SS38	SS37	SS55	SS61	SS62
SS43	SS44	SS56	SS70	SS69
SS48	SS47	SS65	SS71	SS72
CS16	**CS17**	**CS18**	**CS19**	**CS20**
SS58	SS57	SS79	SS74	SS75
SS63	SS64	SS80	SS77	SS76
SS68	SS67	SS81	SS84	SS85
SS73	SS74	SS82	SS87	SS86
CS21	**CS22**	**CS23**	**CS24**	**CS25**
SS91	SS92	SS83	SS94	SS95
SS100	SS99	SS88	SS97	SS96
SS101	SS102	SS93	SS104	SS105
SS110	SS109	SS98	SS107	BH 106 (0-0.1m)

Notes:

m	depth in metres
CS	composite samples
SS	individual samples used to form composite samples

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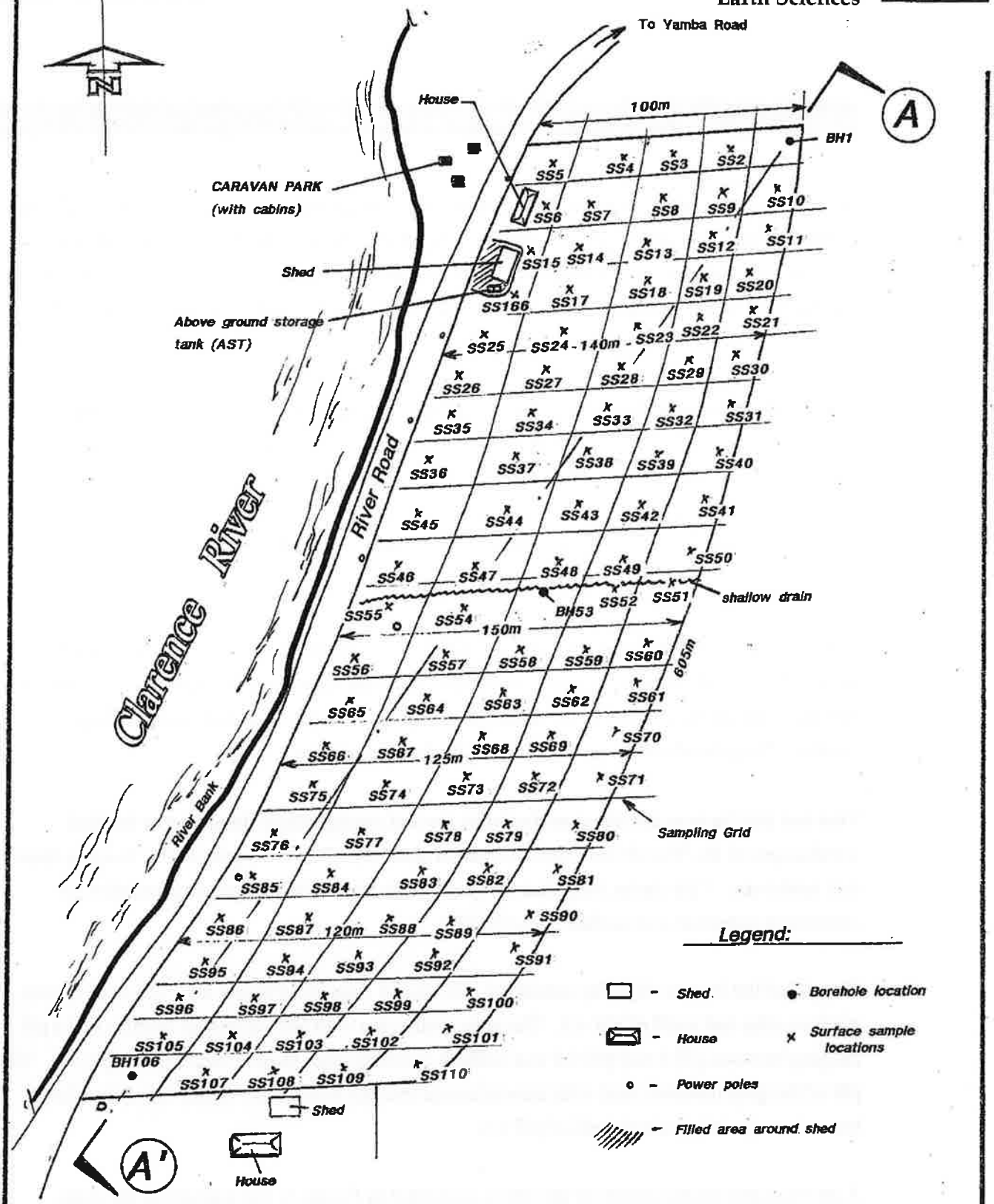


Site Features & Sampling Locations

(Schematic)

Investigation Area = 10ha

Sugar cane plantation

Client:	Mr. P Reid		
Title:	Site Features & Sampling Locations	Drawn: TJ Project Manager: HMc	Fig. 2
Location:	19 River Road, Palmers Island, NSW	Approved:	Date: Jan.03

Job No. 50212 Date 15/07/03 Fig Revised. 16/7/03 Rev. 5/2/03

5.0 STRATIGRAPHY

The natural soils across the site consisted of a layer of brown silty clay, 0.3 metres in depth at boreholes BH1 and BH53 and 0.9 metres in depth at BH106. This brown silty clay was underlain by dark brown medium clay with brown/orange mottles, 0.7 metres in depth at borehole BH1, 0.6 metres in depth at borehole BH53 and 1.2 metres in depth at borehole BH106.

The dark brown medium clay with brown/orange mottles, was underlain by grey sandy clay with brown/orange mottles at a depth of 0.7 metres at borehole BH1, 1.0 metres in depth at borehole BH53 and 1.5 metres at borehole BH106. The grey sandy clay with brown/orange mottles was underlain by grey medium sand with brown/orange mottles at a depth of 1.2 metres at borehole BH1, 1.4 metres in depth at borehole BH53 and 1.7 metres at borehole BH106.

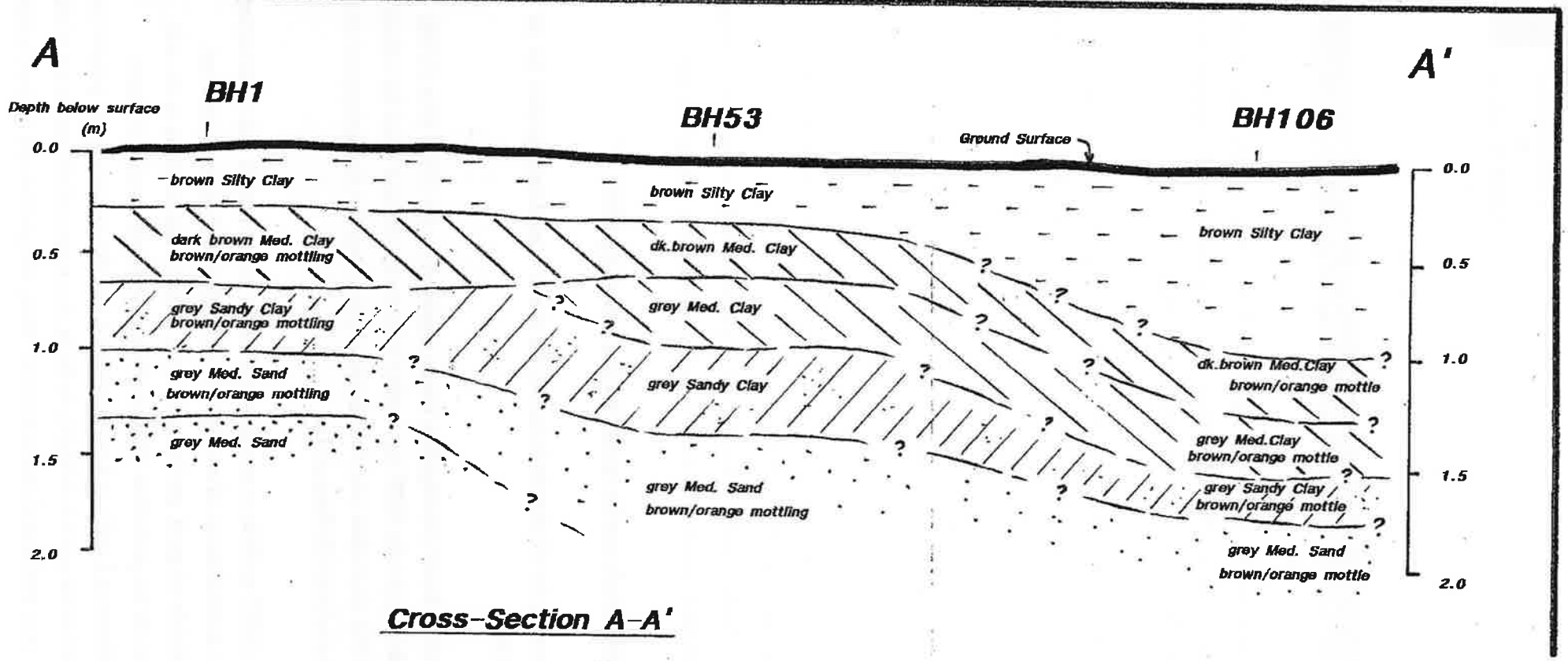
Borehole BH1 was drilled to a depth of 1.4 metres in wet medium grey sand, borehole BH53 was drilled to a depth of 1.8 metres in wet grey medium sand with brown/orange mottles and borehole BH106 to a depth of 2.0 metres in wet grey medium sand with brown/orange mottles. No groundwater was encountered in these boreholes.

This soil profile over the site was similar to the soil stratigraphies described in the Soil Landscapes of the Woodburn 1:100 000 series sheet report as belonging to the Palmers Island soil landscape. This report identifies the grey sandy clay with brown/orange mottles as containing potential acid sulfate soils (PASS).

The pH of the brown silty clay across the site ranged from pH 4 to pH 4.5. The dark brown medium clay had a pH of pH 4.5. The grey sandy clay with brown/orange mottles had a pH ranging between pH 6 and pH 6.5 and without brown/orange mottles had a pH of pH 4.5. The pH of the grey medium sand with brown/orange mottles was pH 4.5 to pH 5.5 and without brown/orange mottles had a pH of pH 4.5.

A stratigraphic cross-section of the site is presented in Figure 3, the transect of the cross-sections can be seen in Figure 2. Borehole logs showing site stratigraphy and soil characteristics are presented as Appendix A.

Job No. 5021/2 Date. 5/2/03 TKJ



Cross-Section A-A'

Inferred Stratigraphy

Note: Vertically Exaggerated.

See Figure 2 for location of section.

Client: Mr.P Reid			
Title: Cross-Section A-A'	Drawn: TJ	Fig. 3	
Location: 19 River Road, Palmers Island,NSW	Project Manager: HMc		
	Approved:	Date: Jan.03	

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Earth Sciences

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6.0 APPLICATION OF RELEVANT GUIDELINES

Environmental & Earth Sciences Pty Ltd refer to the NSW EPA (1998) *Contaminated sites: guidelines for the NSW site auditor scheme* (Reference 9) as the recommended guidelines for contaminant level thresholds, sample selection and site coverage.

The health-based soil investigation levels presented in the NSW EPA (1998) *Contaminated sites: guidelines for the NSW site auditor scheme* are based on the National Environmental Health Forum (NEHF) (1998) *Health-based soil investigation levels* (Reference 3). These investigation levels are derived from toxicity of substances and estimated exposure of humans to the soil. As the site is to be subdivided into rural residential allotments, concentrations listed in Column A of Table 1 in that publication are most applicable. These are reproduced in Table 3 in this document.

In accordance with the NEPC (Reference 7) the data collected in an environmental site assessment are statistically assessed as follows:

— comparison of the arithmetic mean of sampled soil populations to the adopted site criteria;
— comparison of the standard deviation of the sampled populations to 50% of the site criteria; and
— evaluating whether any sample results exceed the site criteria by 250%.

If all these conditions are met, for all chemicals tested, the site is considered suitable for its current or proposed land-use.

The provisional phytotoxicity based investigation levels presented in the NSW EPA (1998) *Contaminated sites: guidelines for the NSW site auditor scheme* are derived from the values supplied in ANZECC (1992) *Australian and New Zealand guidelines for the assessment and management of contaminated sites* (Reference 1).

Table 2 of the ANZECC (1992) guidelines presents criteria for heavy metals and is considered inappropriate for the final determination of ecological risk (and groundwater protection). These criteria, although widely adopted, are based on total metal concentrations in the soil, which bears little relevance to the protection of groundwater, vegetation and soil fauna. Several recent studies (references 2 and 11) have recognised that the contaminants present in the soil solution, a measure of the portion available to biota, is a more reliable indicator of the threat to the environment than total metal concentrations. Thus, the provisional phytotoxicity

guideline values presented in the NSW EPA (1998) guidelines and derived from the ANZECC (1992) guidelines are not directly applicable to this site. Phytotoxicity is considered better assessed visually and chemically on a site-specific basis.

As groundwater was not encountered during this investigation, application of groundwater guidelines are not presented.

TABLE 3

NATIONAL ENVIRONMENTAL HEALTH FORUM HEALTH-BASED SOIL INVESTIGATION LEVELS (1996)

SUBSTANCE	Health-based Soil Investigation Levels (mg/kg)				
Exposure Settings	**A**	**B[a]**	**C[a]**	**D**	**E**	**F**
Aldrin + Dieldrin	10			40	20	50
Arsenic (total)	100			400	200	500
Benzo (a) pyrene	1			4	2	5
Beryllium	20			80	40	100
Boron	3 000			12 000	6 000	15 000
Cadmium	20			80	40	100
Chlordane	50			200	100	250
Chromium (III)	12%			48%	24%	60%
Chromium (VI)	100			400	200	500
Cobalt	100			700	200	500
Copper	1 000			4 000	2 000	5 000
Cyanides (complexed)	500			2 000	1 000	2 500
DDT+DDD+DDE	200			800	400	1 000
Heptachlor	10			40	20	50
Lead	300			1 200	600	1 500
Manganese	1 500			6 000	3 000	7 500
Methyl mercury	10			40	20	50
Mercury (inorganic)	15			60	30	75
Nickel	600			2 400	600	3 000
Total PAH	20			80	40	100
PCBs (total)	10			40	20	50
Phenol	8 500			34 000	17 000	42 500
TPH $>C_{16}$-C_{35} aromatics	90			360	180	450
TPH $>C_{16}$-C_{35} aliphatics	5 600			22 400	11 200	28 000
TPH $>C_{35}$	56 000			224 000	112 000	280 000
Zinc	7 000			28 000	14 000	35 000

Exposure Settings:

A. 'Standard' residential with garden/accessible soil (less than 10% intake of home grown produce; no poultry): this category includes children's day-care, pre-schools etc.

B. Residential with substantial vegetable garden (contributing up to 50% of vegetable and fruit intake) and poultry providing all dietary egg intake and 25% poultry meat intake.

C. Residential with substantial vegetable garden (contributing up to 50% of vegetable and fruit intake); poultry excluded.

D. Residential with minimal opportunities for soil access includes high-rise apartments and flats.

E. Parks, recreational open space and playing fields: includes secondary schools.

F. Commercial/Industrial: includes premises such as shops and offices as well as factories and industrial sites. (If, however, a commercial site is also used for residential purposes or regular soil access by children if possible then the appropriate 'residential' setting should be used.) It is assumed that thirty years is the duration of exposure.

[a] Site and contaminant specific

7.0 LABORATORY ANALYSIS

A total of 107 surface samples and 15 soil samples from three boreholes were collected during the field investigation. Twenty two selected composited samples and six discrete samples were analysed for either organic or inorganic compounds. The organic analysis was carried out at Australian Government Analytical Laboratories (AGAL), whilst the inorganic analysis was undertaken at Sydney Analytical Laboratories (SAL). The results and laboratory transcripts are presented in Appendix C.

A discussion on quality assurance and quality control is given in Appendix D of this report. Laboratory duplicates and surrogate recoveries were conducted as part of the analysis, these results are presented in Appendix C.

7.1 Tests undertaken

Organic analysis was undertaken on selected soil samples for organochlorine pesticides (OCPs) and total petroleum hydrocarbons (TPH). The selection of the samples for OCP analysis was to allow adequate coverage across the site including areas (ie. drainage lines) where sediment runoff could accumulate. Analysis for OCPs was undertaken on discrete samples, selected from areas near drainage lines, and composite samples selected from across the site. The selection of samples for TPH analysis was to target the AST.

Inorganic analysis undertaken on the soil samples included the following metals: copper, lead, zinc, cadmium, chromium, nickel, arsenic and mercury. The basis for selection of samples for inorganic analysis was to allow adequate coverage across the site and to target areas of concern.

7.2 Laboratory results

The laboratory results are presented in Tables 4, 5 and 6 and in Appendix C.

TABLE 4

SOIL ORGANIC RESULTS - ORGANOCHLORINE PESTICIDES

Sample I D	EQL[a]	CS1	CS3	CS8	CS9	CS11	CS13	CS14	CS16	Guidelines
Depth (m)		**0-0.1**	**0-0.1**	**0-0.1**	**0-0.1**	**0-0.1**	**0-0.1**	**0-0.1**	**0-0.1**	
BHC (total)	0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-
Lindane	0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-
Aldrin	0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-
Dieldrin	0.005	<0.01	<0.01	<0.01	<0.01	0.011	<0.01	0.012	<0.01	-
Heptachlor	0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	2.5[a]/10[b]
Heptachlor Epoxide	0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-
DDD	0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-
DDE	0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-
DDT	0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-
Total Endosulfan	0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-
Endrin	0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-
Chlordane	0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	12.5[a]/50[b]
Methoxychlor	0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-
HCB	0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-
Aldrin+Dieldrin	-	ND	ND	ND	ND	0.011	ND	0.012	ND	2.5[a]/10[b]
DDD+DDE+DDT	-	ND	ND	ND	ND	ND	ND	ND	ND	50[a]/200[b]

Notes:

1. all results expressed in mg/kg (ppm) on a dry weight basis
2. EQL Estimated Quantitation Limit
3. ND not detected above EQL
4. CS composite sample
5. SS individual surface sample
6. guideline levels taken from NEHF (1998) Column A for 'Standard' residential landuse. Human health investigation threshold criteria only. Does not consider environmental, aesthetic or leachability issues
7. [a] guideline levels are divided by the number of individual samples used to form the composite sample, in this case four (4).
8. [b] guideline level for an individual sample

TABLE 4 (CONT)

SOIL ORGANIC RESULTS – ORGANOCHLORINE PESTICIDES

Sample ID	EQL[a]	CS21	CS23	CS25	SS51	SS52	BH53	SS54	Guidelines
Depth (m)		0-0.1	0-0.1	0-0.1	0-0.1	0-0.1	0-0.1	0-0.1	
BHC (total)	0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-
Lindane	0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-
Aldrin	0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-
Dieldrin	0.005	<0.01	<0.01	<0.01	0.011	0.013	<0.01	<0.01	-
Heptachlor	0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	2.5[a]/10[b]
Heptachlor Epoxide	0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-
DDD	0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-
DDE	0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-
DDT	0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-
Total Endosulfan	0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-
Endrin	0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-
Chlordane	0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	12.5[a]/50[b]
Methoxychlor	0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-
HCB	0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-
Aldrin+Dieldrin	-	ND	ND	ND	0.011	0.013	ND	0.012	2.5[a]/10[b]
DDD+DDE+DDT	-	ND	ND	ND	ND	ND	ND	ND	50[a]/200[b]

Notes:

1. all results expressed in mg/kg (ppm) on a dry weight basis
2. EQL Estimated Quantitation Limit
3. ND not detected above EQL
4. CS composite sample
5. SS individual surface sample
6. guideline levels taken from NEHF (1998) Column A for 'Standard' residential landuse. Human health investigation threshold criteria only. Does not consider environmental, aesthetic or leachability issues
7. [a] guideline levels are divided by the number of individual samples used to form the composite sample, in this case four (4).
8. [b] guideline level for an individual sample

TABLE 5

ORGANIC LABORATORY RESULTS – TPH

Borehole	EQL	SS16	NEHF Guidelines
Depth (m)		**0.1-0.2**	
TPH			
C_6-C_9	25	<25	65[a]
C_{10}-C_{14}	50	<50	
C_{15}-C_{28}	100	<100	TPH C_{10}-C_{40}[a]
C_{29}-C_{36}	100	<100	
Total TPH (C_{10}-C_{36})		ND	1000[a]

Notes:

1. all results expressed in mg/kg (ppm) on a dry weight basis
2. - no individual value
3. EQL Estimated Quantitation Limit
4. Guideline levels taken from NEHF column A for 'Standard' residential – these are based on human health investigation threshold criteria only and do not consider environmental, aesthetic or leachability issues
5. [a] Guideline levels for sensitive land use taken from NSW EPA *Guidelines for assessing service station sites* (1994)
6. ND not detected above EQL

TABLE 6

INORGANIC LABORATORY RESULTS HEAVY METALS

Borehole	EQL	CS2	CS4	CS5	CS6	CS10	CS12	Guidelines
Depth (m)		0-0.1	0-0.1	0-0.1	0-0.1	0-0.1	0-0.1	
Copper	0.5	17	15	20	15	15	16	1 000
Lead	0.5	17	18	27	19	20	18	300
Zinc	0.5	57	56	67	54	56	53	7 000
Cadmium	0.5	-	-	<0.5	-	-	-	20
Chromium	0.5	-	-	15	-	-	-	100
Nickel	0.5	-	-	6.0	-	-	-	600
Arsenic	0.5	-	-	5.0	-	-	-	100
Mercury	0.005	-	-	0.090	-	-	-	15

Borehole	EQL	CS15	CS18	CS19	CS20	CS24	SS67	Guidelines
Depth (m)		0-0.1	0-0.1	0-0.1	0-0.1	0-0.1	0-0.1	
Copper	0.5	15	15	15	23	17	10	1 000
Lead	0.5	20	20	21	10	22	19	300
Zinc	0.5	59	59	58	50	74	51	7 000
Cadmium	0.5	<0.5	-	-	<0.5	-	-	20
Chromium	0.5	16	-	-	15	-	-	100
Nickel	0.5	10	-	-	8.0	-	-	600
Arsenic	0.5	5.5	-	-	5.0	-	-	100
Mercury	0.005	0.12	-	-	0.12	-	-	15

Notes:

1. results are expressed in mg/kg (ppm) dry weight
2. – denotes not analysed
3. EQL = Estimated Quantitation Limit
4. guideline values taken from NEHF (1998) *Health-based soil investigation levels*, column A for residential landuse
5. shading indicates exceedence of guideline levels
6. for composite samples, guideline value must be divided by the number of component samples (see Table 3)

8.0 DISCUSSION

Historical information gathered indicated that the western edge of the property had been utilised for the cultivation of sugar cane since at least 1966. No evidence of major development or imported fill material was observed on site.

All site vegetation appeared healthy and vigorous which suggests that site activities, past or present, have not caused contamination to any soil on site that could cause phyto-toxic effects on plants.

8.1 Organic analysis results

The majority of recorded organochlorine pesticides (OCPs) concentrations were below detection limits. However trace concentrations of dieldrin were detected in surface samples SS51 (0.011 mg/kg) and 52 (0.013 mg/kg) and composite samples CS11 (0.011 mg/kg) and 14 (0.012 mg/kg). These concentrations did not exceed the adjusted site criterion (2.5 mg/kg).

The organic laboratory tests for total petroleum hydrocarbons (TPH) showed that surface sample SS16 did not contain detectable levels of TPH. Even though surface sample SS16 was not stored in a suitable container as specified by the industry standard, the result is still pertinent to this study. It would be expected that if TPH were present in these soils, they would be bound by clay particles within the soils of the sample and that an elevated concentration of TPH would have been detected within the soil sample. Therefore, as TPH was non-detectable in surface sample SS16, it can be deduced that the natural fill material east of the AST has not been impacted by diesel stored in the AST located south of the shed on site.

8.2 Inorganic analysis results

The consistency of results for concentrations of heavy metals in all samples analysed would indicate that these levels are likely to represent background concentrations for these soil types and are well below human health soil investigation levels. Therefore, these results indicate that there is minimal potential for heavy metal contamination at this site.

Based on the organic and inorganic results obtained, there is no human health or environmental concerns associated with OCPs or heavy metals in the soil on this site under 'Standard' residential or any other land use zoning. As the site is classified by the Department

of Land and Water Conservation as being within a high risk acid sulfate soil (ASS) class, there may be the occurrence of potential acid sulfate soils (PASS) at depths of between one and three metres across the site.

9.0 CONCLUSION

The historical review by Environmental & Earth Sciences as part of a DSI of 19 River Road, Palmers Island, NSW indicated that the previous use of the site was principally for sugar cane cultivation. A subsequent field investigation assessed the presence of identified chemicals of concern, namely organochlorine pesticides (OCPs), total petroleum hydrocarbons (TPH) and heavy metals.

The results of the field investigation indicated the following:

- trace concentrations of dieldrin were detected in several surface samples, these elevated concentrations were well below site criterion;
- all other samples analysed for a range of organic compounds contained non-detectable concentrations of organochlorine pesticides (OCP) and total petroleum hydrocarbons (TPH); and
- samples analysed for heavy metals indicate that concentrations are likely to represent background concentrations and do not exceed relevant guideline values. Based on these findings, there is no apparent potential for groundwater to have been impacted by site activities, past or present.

As a result of the historical survey and detailed site study, the property can be considered, with regard to soil and groundwater contamination from organochlorine pesticides (OCP), total petroleum hydrocarbons (TPH) and heavy metals, suitable for the proposed residential subdivision.

10.0 GLOSSARY OF TERMS

The following descriptions are of terms used in reports of this kind. A list of the references used in providing this glossary are presented in Section 8 of this report.

Colluvial — unconsolidated soil and rock material moved downslope by gravity.

Dispersion — The process by which species in solution mix with a second solution, thus reducing in concentration. In particular, relates to the reduction in concentration resulting from the movement of flowing groundwater.

Gradational — the lower boundary between soil layers (horizons) has a gradual transition to the next layer. The solum (soil horizon) becomes gradually more clayey with depth.

Laminite — thinly bedded fine-grained sedimentary rock.

Lithic — Containing large amounts of fragments derived from previously formed rocks.

Mottled — masses, blobs or blotches of sub-dominant colours with varying value/chroma (colour grades) in the soil matrix.

Profile — the solum. This includes the soil A and B horizons and is basically the depth of soil to weathered rock.

Sheet erosion — the removal of surface material from a wide area of gently sloping or graded land by broad continuous sheets of running water rather than by streams.

Swale — A linear level-floored open depression excavated by the wind or formed by the build-up of two adjacent ridges. Typically associated with the depression between two sand dunes.

Texture — is the size of particles in the soil. Texture is divided into six groups, depending on the amount of coarse sand, fine sand, silt and clay in the soil.

11.0 REFERENCES

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APPENDIX A

RELEVANT CLEARANCE CERTIFICATES

Land and Property Information

LAND AND PROPERTY INFORMATION NSW

CENTRAL REGISTER OF RESTRICTIONS

2213U - ENVIRONMENTAL & EARTH SCIENCES

APPLN NO: 142210 ISSUED: 6/12/2002 9:48 AM

YOUR REFERENCE: 2/186236 PAGE 1 of 1

Certificate

REFERENCE: 2/186236, 22/632068, 35/661175

LGA: MACLEAN

PARISH: TALOUMBI COUNTY: CLARENCE

NO. OF AUTHORITIES INQUIRED OF: 1

THE FOLLOWING AUTHORITIES HAVE A POSSIBLE OR ACTUAL INTEREST IN THIS PROPERTY. YOUR INQUIRY HAS BEEN REFERRED TO THEM FOR DIRECT RESPONSE:

ENVIRONMENT PROTECTION AUTHORITY

REGISTRAR GENERAL

***** END OF CERTIFICATE *****

Hugh McCaffery
Environmental & Earth Sciences
PO Box 380
NORTH SYDNEY

LAND & WATER CONSERVATION

Contact: Lynne Cairns
Phone: (02) 66 402092
Fax: (02) 66 402100
e-mail: lcairns@dlwc.nsw.gov.au

16 January 2003

Our Ref: Letter.doc

Dear Mr McCaffery

Subject: Groundwater Bore Summary Sheets –Palmers Island

A bore search was conducted in the Palmers Island area within a 6 km radius of the required site, grid reference E 527289 N 6745018. Six groundwater works were located as listed below. Please find in the attached the Work Summary Report for each of these groundwater works. A diagram showing the location of these groundwater works is also attached.

GW063628	GW065734	GW301178	GW301181	GW301400	GW301446

Please note that other licensed groundwater works may exist in the area that have not yet been entered into the Department's database. Unlicensed groundwater works may also exist in the area.

A fee of $99 is payable for this search. An invoice for same will be forwarded by post.

If you have any further enquiries please contact Richard Green on 66402120.

Yours sincerely

Lynne Cairns
Resource Information Officer Licensing
Hydrogeology Unit

Warning to Clients

Water data have been supplied to the Department of Land and Water Conservation (DLWC) by various sources. In some cases, analyses, plots and other data presentations make use of the information on the DLWC archive. Because of the historic nature of the archive, there may be errors and omissions in the data, or the quality of the information may make it unsuitable for the intended purpose.
Data integrity may not have been examined before use in the analytical programs and the DLWC makes no guarantee that they conform to any guidelines.
Users of these data should be aware that the use and any interpretation of the data is at their own risk and the DLWC will not be held responsible for any decisions made based on these data

Date/Time :16-Jan-2003 9:51 AM
User :LASMITH
Report :RMGW001D.QRP
Executable :S:\G5\PROD32\GROUND.EXE
Exe Date :29-Nov-2002
System :Groundwater
Database :Diwcp

DEPARTMENT OF LAND & WATER CONSERVATION
Work Summary

GW063628 *Converted From HYDSYS*

License :

	Authorised Purpose(s)	Intended Purpose(s)
Work Type : Bore		DOMESTIC
Work Status : (Unknown)		STOCK
Construct. Method : Rotary Air		
Owner Type : Private		

Commenced Date : **Final Depth :** 37.00 m
Completion Date : 01-Sep-1986 **Drilled Depth :** 37.00 m

Contractor Name :
Driller : 1504 JACKWITZ, William Douglas

Property : **Standing Water Level :**
GWMA : **Salinity :** 0-500 ppm
GW Zone : **Yield :**

Site Details

Site Chosen By	County	Parish	Portion/Lot DP
	Form A :CLARENCE	TALOUMBI	109
	Licensed :		

Region : 30 - NORTH COAST **CMA Map :** 9539-3S MACLEAN
River Basin : 204 - CLARENCE RIVER **Grid Zone :** 56/2 **Scale :** 1:25,000
Area / District :

Elevation : **Northing :** 6740550 **Latitude (S) :** 29° 27' 51"
Elevation Source : (Unknown) **Easting :** 523085 **Longitude (E) :** 153° 14' 17"

GS Map : 0006A2 **AMG Zone :** 56 **Coordinate Source :** GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

H	P	Component	Type	>From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1	1	Casing	P.V.C.	0.00	37.00	125			Seated on Bottom
1	1	Opening	Slots - Vertical	19.00	37.00	125		1	SL: 0mm; A: 3mm

Water Bearing Zones

>From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
17.00	18.00	1.00	Consolidated			0.13			0-500 ppm
34.00	35.00	1.00	Consolidated			0.26			0-500 ppm

Drillers Log

>From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
0.00	2.00	2.00	Clay	Clay	
2.00	18.00	16.00	Sandstone Soft Water Supply	Sandstone	
18.00	37.00	19.00	Sandstone Water Supply	Sandstone	
18.00	37.00	19.00	Coal Shale	Coal	

Pumping Tests - Summaries

Pumping Test Type	Date	Duration (hr)	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Intake Depth (m)	Test Method	To Measure Water Level	To Measure Discharge	Tested By
Single-Rate Pumping Test	17-Sep-1986				0.39		Airlift			

Pumping Tests - Readings

Pumping Test Type	Date	Time (mins)	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Intake Depth (m)	Test Method	To Measure Water Level	To Measure Discharge	Tested By

(No Pumping Test Reading Details Found)

Chemical Treatment

Treatment	Method	Duration	Success

(No Chemical Treatment Details Found)

Development

Method	Time Taken	Other Development Method

(No Development Details Found)

DEPARTMENT OF LAND & WATER CONSERVATION
Work Summary

GW063628 *Converted From HYDSYS*

Remarks

TDS = 120 MG/L

***** End of GW063628 *****

DEPARTMENT OF LAND & WATER CONSERVATION
Work Summary

GW065734 *Converted From HYDSYS*

License :30BL138589

	Authorised Purpose(s)	Intended Purpose(s)
Work Type :Bore	DOMESTIC	DOMESTIC
Work Status :(Unknown)		
Construct. Method :Rotary		
Owner Type :Private		

Commenced Date : Final Depth : 24.00 m
Completion Date :27-Nov-1988 Drilled Depth : 24.00 m

Contractor Name :SLADE DRILLING
Driller :1160 SLADE, Phillip Henry

Property :
GWMA : -
GW Zone : -
Standing Water Level : 11.00 m
Salinity :
Yield : 1.14 L/s

Site Details

Site Chosen By

County	Parish	Portion/Lot DP
Form A :CLARENCE	TALOUMBI	LOT 4 DP1002238
Licensed :CLARENCE	TALOUMBI	LT4 DP58449

Region :30 - NORTH COAST
River Basin :204 - CLARENCE RIVER
Area / District :
CMA Map :9539-3S MACLEAN
Grid Zone :56/2 Scale :1:25,000

Elevation : 0.00
Elevation Source :
Northing :6740175 Latitude (S) :29° 28' 3"
Easting :523875 Longitude (E) :153° 14' 46"

GS Map :0006A3 AMG Zone :56 Coordinate Source :

Construction

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

H	P	Component	Type	>From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1	1	Casing	PVC Class 9	0.00	24.00	137			Sealed on Bottom
1	1	Opening	Slots - Diagonal	18.00	24.00	137		1	PVC; SL: 6mm; A: 3mm

Water Bearing Zones

>From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
18.00	21.00	3.00	Consolidated	11.00		1.14	24.00		

Drillers Log

>From (m)	To (m)	Thickness(m)	Drillers	Geological Material	Comments
0.00	1.00	1.00	TOPSOIL		
1.00	10.00	9.00	SOFT SANDSTONE		
10.00	24.00	14.00	SANDSTONE		

Pumping Tests - Summaries

Pumping Test Type	Date	Duration (hr)	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Intake Depth (m)	Test Method	To Measure Water Level	To Measure Discharge	Tested By
Single-Rate Pumping Test	27-Nov-1988		11.00		1.14		Airlift			

Pumping Tests - Readings

Pumping Test Type	Date	Time (mins)	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Intake Depth (m)	Test Method	To Measure Water Level	To Measure Discharge	Tested By

(No Pumping Test Reading Details Found)

Chemical Treatment

Treatment	Method	Duration	Success

(No Chemical Treatment Details Found)

Development

Method	Time Taken	Other Development Method

(No Development Details Found)

Remarks

***** End of GW065734 *****

DEPARTMENT OF LAND & WATER CONSERVATION
Work Summary

GW301178

License :30BL176897

Work Type :Bore
Work Status :(Unknown)
Construct. Method :Rotary
Owner Type :

Authorised Purpose(s)	Intended Purpose(s)
DOMESTIC	DOMESTIC

Commenced Date :
Completion Date :16-Aug-1995
Final Depth : 42.00 m
Drilled Depth : 42.00 m

Contractor Name :TANNER DRILLING
Driller :1412 TANNER, Robert Leslie

Property : - SMITH'S
GWMA : -
GW Zone : -

Standing Water Level : 7.00 m
Salinity : Good
Yield : 0.38 L/s

Site Details

Site Chosen By		County	Parish	Portion/Lot DP
Diviner	Driller	Form A :CLARENCE	TALOUMBI	LOT 1 DP606338
		Licensed :CLARENCE	TALOUMBI	LT 1 DP 606338

Region :30 - NORTH COAST
River Basin :
Area / District :

CMA Map :
Grid Zone :
Scale :

Elevation :
Elevation Source :

Northing :6740863
Easting :524168

Latitude (S) :29° 27' 41"
Longitude (E) :153° 14' 57"

GS Map :
AMG Zone :56
Coordinate Source :

Construction

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

H	P	Component	Type	>From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1		Hole	Hole	0.00	18.00	140			Rotary Air
1		Hole	Hole	18.00	42.00	140			Down Hole Hammer
1	1	Casing	PVC Class 9	-0.30	42.00	125			Glued; Seated on Bottom; Cap
1	1	Opening	Slots - Vertical	24.00	29.00	125			PVC Class 9; Sawn; SL: 100mm; A: 2.6mm
1	1	Opening	Slots - Vertical	34.00	39.00				Sawn; SL: 100mm; A: 2.6mm

Water Bearing Zones

>From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
24.00	29.00	5.00		7.00		0.13			
34.00	39.00	5.00		7.00		0.25	42.00	1.00	Good

Drillers Log

>From (m)	To (m)	Thickness(m)	Drillers	Geological Material	Comments
0.00	0.30	0.30	[illegible]SOIL		
0.30	6.00	5.70	YELLOW CLAY		
6.00	12.00	6.00	YELLOW SANDSTONE		
12.00	18.00	6.00	GREY SANDSTONE		
18.00	24.00	6.00	GREY SANDSTONE		
24.00	29.00	5.00	CRACKY GREY SANDSTONE		
29.00	34.00	5.00	GREY SANDSTONE		
34.00	39.00	5.00	CRACKY GREY SANDSTONE		
39.00	42.00	3.00	GREY SANDSTONE		

Pumping Tests - Summaries

Pumping Test Type	Date	Duration (hr)	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Intake Depth (m)	Test Method	To Measure Water Level	To Measure Discharge	Tested By

(No Pumping Test Summary Details Found)

Pumping Tests - Readings

Pumping Test Type	Date	Time (mins)	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Intake Depth (m)	Test Method	To Measure Water Level	To Measure Discharge	Tested By

(No Pumping Test Reading Details Found)

Chemical Treatment

Treatment	Method	Duration	Success

(No Chemical Treatment Details Found)

Development

Method	Time Taken	Other Development Method
Air	1.00	

Remarks

Form A Remarks:

DEPARTMENT OF LAND & WATER CONSERVATION
Work Summary

GW301178

NOTE: Casing completed at top with 600 x 600 mm deep surface pad.

*** End of GW301178 ***

DEPARTMENT OF LAND & WATER CONSERVATION
Work Summary

GW301181

License :30BL176899

Work Type :Bore
Work Status :(Unknown)
Construct. Method :Rotary
Owner Type :

Authorised Purpose(s)	Intended Purpose(s)
DOMESTIC	DOMESTIC

Commenced Date :
Completion Date :20-Aug-1995
Final Depth : 33.00 m
Drilled Depth : 33.00 m

Contractor Name :TANNER DRILLING
Driller :1412 TANNER, Robert Leslie

Property : - BLEACHS
GWMA : -
GW Zone : -

Standing Water Level : 21.00 m
Salinity : Good
Yield : 0.76 L/s

Site Details

Site Chosen By		County	Parish	Portion/Lot DP
Diviner	Driller	Form A :CLARENCE	TALOUMBI	LOT 11 DP1000495
		Licensed :CLARENCE	TALOUMBI	LOT 1 DP819132

Region :30 - NORTH COAST
River Basin :
Area / District :

CMA Map :
Grid Zone :
Scale :

Elevation :
Elevation Source :

Northing :6740349
Easting :523244

Latitude (S) :29° 27' 58"
Longitude (E) :153° 14' 23"

GS Map :
AMG Zone :56
Coordinate Source :

Construction

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

H	P	Component	Type	>From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1		Hole	Hole	0.00	3.00	140			Rotary Air
1		Hole	Hole	3.00	33.00	140			Down Hole Hammer
1	1	Casing	PVC Class 9	-0.30	33.00	125			Glued; Seated on Bottom; Cap
1	1	Opening	Slots - Vertical	27.00	31.00	125			PVC Class 9; Sawn; SL: 100mm; A: 2.6mm

Water Bearing Zones

>From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
27.00	31.00	4.00		21.00		0.76	33.00	1.00	Good

Drillers Log

>From (m)	To (m)	Thickness(m)	Drillers	Geological Material	Comments
0.00	0.30	0.30	[illegible]SOIL		
0.30	3.00	2.70	GREY CLAY		
3.00	26.00	23.00	GREY MUDSTONE		
26.00	27.00	1.00	BLACK SHALE		
27.00	31.00	4.00	CRACKY BLACK SHALE		
31.00	33.00	2.00	BLACK SHALE		

Pumping Tests - Summaries

Pumping Test Type	Date	Duration (hr)	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Intake Depth (m)	Test Method	To Measure Water Level	To Measure Discharge	Tested By

(No Pumping Test Summary Details Found)

Pumping Tests - Readings

Pumping Test Type	Date	Time (mins)	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Intake Depth (m)	Test Method	To Measure Water Level	To Measure Discharge	Tested By

(No Pumping Test Reading Details Found)

Chemical Treatment

Treatment	Method	Duration	Success

(No Chemical Treatment Details Found)

Development

Method	Time Taken	Other Development Method
Air	1.00	

Remarks

Form A Remarks:
Bore to be fitted with submersable pump, to fill a 22 730 litre tank for domestic use. Top of bore casing finished with 600 x 600 mm deep cement surface pad.

*** End of GW301181 ***

DEPARTMENT OF LAND & WATER CONSERVATION
Work Summary

GW301400

License :30BL177147

Work Type :Bore
Work Status :(Unknown)
Construct. Method :
Owner Type :

Authorised Purpose(s): DOMESTIC
Intended Purpose(s): DOMESTIC

Commenced Date :
Completion Date :13-Nov-1994
Final Depth : 6.00 m
Drilled Depth :

Contractor Name :
Driller :

Property : - CAPEL'S
GWMA : -
GW Zone : -

Standing Water Level :
Salinity :
Yield :

Site Details

Site Chosen By

	County	Parish	Portion/Lot DP
Form A :	CLARENCE	YAMBA	LOT 199 DP260230
Licensed :	CLARENCE	YAMBA	LT 199 DP 260230

Region :30 - NORTH COAST
River Basin :
Area / District :

CMA Map :
Grid Zone :
Scale :

Elevation :
Elevation Source :

Northing :6744845
Easting :531582
Latitude (S) :29° 25' 31"
Longitude (E) :153° 19' 32"

GS Map :
AMG Zone :56
Coordinate Source :Map Interpretation

Construction

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

H	F	Component	Type	>From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1		Hole	Hole	0.00	6.00	76.2			Hand Dug
1		Hole	Hole	0.00	6.00	76200			Other
1	1	Casing	Lining	0.00	6.00				

Water Bearing Zones

>From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)

(No Water Bearing Zone Details Found)

Drillers Log

>From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments

(No Drillers Log Details Found)

Pumping Tests - Summaries

Pumping Test Type	Date	Duration (hr)	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Intake Depth (m)	Test Method	To Measure Water Level	To Measure Discharge	Tested By

(No Pumping Test Summary Details Found)

Pumping Tests - Readings

Pumping Test Type	Date	Time (mins)	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Intake Depth (m)	Test Method	To Measure Water Level	To Measure Discharge	Tested By

(No Pumping Test Reading Details Found)

Chemical Treatment

Treatment	Method	Duration	Success

(No Chemical Treatment Details Found)

Development

Method	Time Taken	Other Development Method

(No Development Details Found)

Remarks

Form A Remarks:
SPEAR POINT

*** End of GW301400 ***

DEPARTMENT OF LAND & WATER CONSERVATION
Work Summary

GW301446

License :30BL177309

Work Type :Bore
Work Status :(Unknown)
Construct. Method :
Owner Type :

Authorised Purpose(s): DOMESTIC
Intended Purpose(s):

Commenced Date :
Completion Date :08-May-1996
Final Depth : 7.00 m
Drilled Depth :

Contractor Name :
Driller : MC LEOD, JOHN

Property : - MEPPEM
GWMA : -
GW Zone : -

Standing Water Level :
Salinity :
Yield : 0.02 L/s

Site Details

Site Chosen By

	County	Parish	Portion/Lot DP
Form A :	CLARENCE	YAMBA	LOT 36 DP786682
Licensed :	CLARENCE	YAMBA	LT 36 DP 786682

Region :30 - NORTH COAST
River Basin :
Area / District :

CMA Map :
Grid Zone :
Scale :

Elevation :
Elevation Source :

Northing :6745179
Easting :530951
Latitude (S) :29° 25' 20"
Longitude (E) :153° 19' 9"

GS Map :
AMG Zone :56
Coordinate Source :

Construction

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

H	P	Component	Type	>From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1		Hole	Hole	0.00	7.00	90			(Unknown)
1		Hole	Hole	0.00	7.00	90			Other
1	1	Casing	Lining	0.00	0.00				

Water Bearing Zones

>From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)

(No Water Bearing Zone Details Found)

Drillers Log

>From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments

(No Drillers Log Details Found)

Pumping Tests - Summaries

Pumping Test Type	Date	Duration (hr)	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Intake Depth (m)	Test Method	To Measure Water Level	To Measure Discharge	Tested By

(No Pumping Test Summary Details Found)

Pumping Tests - Readings

Pumping Test Type	Date	Time (mins)	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Intake Depth (m)	Test Method	To Measure Water Level	To Measure Discharge	Tested By

(No Pumping Test Reading Details Found)

Chemical Treatment

Treatment	Method	Duration	Success

(No Chemical Treatment Details Found)

Development

Method	Time Taken	Other Development Method

(No Development Details Found)

Remarks

Form A Remarks:
SPEARPOINT; NOT MUCH DETAILS ON FORM 'A' ; METHOD OF DRILLING IS "VENTURI" (?)

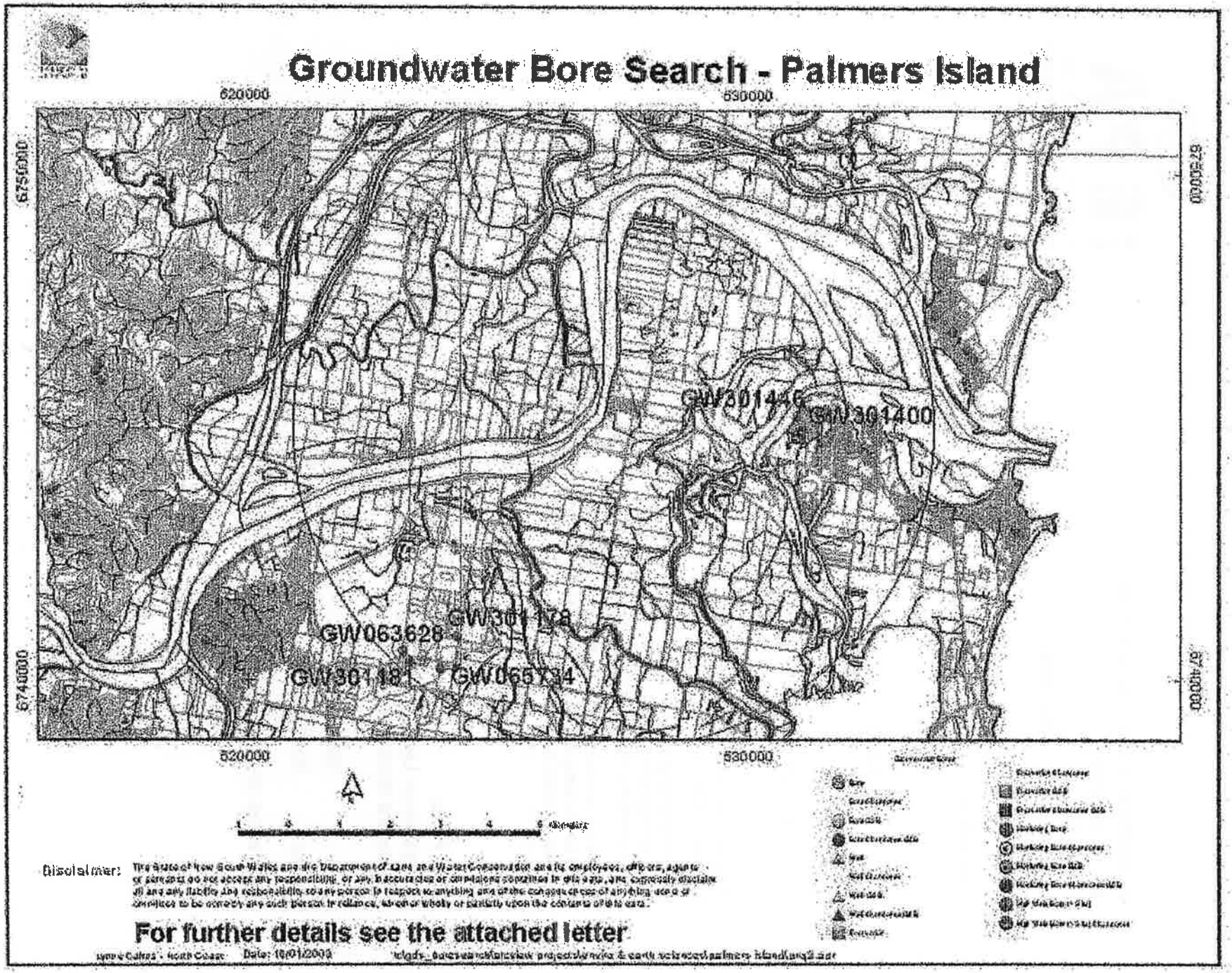
***** End of GW301446 *****

DEPARTMENT OF LAND & WATER CONSERVATION
Work Summary

GW301446

*** End of Report ***

Groundwater Bore Search - Palmers Island



Disclaimer: The State of New South Wales and the Department of Land and Water Conservation and its employees, officers, agents or servants do not accept any responsibility, or any inaccuracies or omissions contained in this map, and expressly disclaim all and any liability (including responsibility to any person in respect to anything and the consequences of anything done or omitted to be done by any such person in reliance, whether wholly or partially upon the contents of this map.

Date: 16/01/2003

NSW EPA
PO Box A290, Sydney South 1232
PHONE 9995 5495, FAX 9995 5962

Environmental & Earth Sciences Pty Ltd
Att: Ian Parkinson
PO Box 380
NORTH SYDNEY NSW 2059

Our Reference: 150740

Your Reference:

Verification of Notices under Unhealthy Building Land Act

Re : Street: RIVER RD PALMERS ISLAND
Folio Identifier: 2//DP 186236
22/632068,35/661175

The Environment Protection Authority currently has no statutory notices issued under the provisions of the Unhealthy Building Land Act 1990 for the subject land.

Following commencement of the Contaminated Land Management Act 1997 on 1 September 1998, the Environment Protection Authority no longer issues notices under S.35 or 36 of the Environmentally Hazardous Chemicals Act 1985.

Remaining current EHC Act notices, as well as current action taken under the CLM Act will now be noted on planning certificates issued by local councils under S.149(2) of the Environment Planning and Assessment Act.

Gretel Purser
Acting Manager Land & Waste Information Databases
Chemicals & Waste Branch

Date: 13/01/03
Paid by BULK-LPI

** On receipt, please check that the property details above are correct.

Maclean Shire Council

PLANNING CERTIFICATE UNDER SECTION 149
Environmental Planning and Assessment Act 1979 (as amended)

APPLICANT NAME:	**ENVIRONMENTAL & HEALTH SERVICES**	**CERTIFICATE NO:**	**1080/2002**
ADDRESS:	**PO BOX 195 LENNOX HEAD 2478**	**DATE**	**5/12/02**

Office Use Only	
Fee Paid:	**$40**
Receipt No:	**7329**

REFERENCE:

ADDRESS OF PROPERTY: **19 RIVER ROAD, PALMERS ISLAND**

LOT NO:	**2**	**SECTION NO.**	**D.P. 186236**
	22		**632068**
	35		**661175**

PART A
Local Environmental Plans, deemed Environmental Planning Instruments current at the date of this Certificate, restrict or purport to restrict the purposes for which development may be carried out on the land in the manner set out in Schedule 1 of Annexure A attached to this Certificate.
NOTE: This property does not contain a heritage item
However refer to Division 6 of Annexure A for further details concerning heritage items
Draft Local Environmental Plans placed on exhibition pursuant to Section 66(1)(b) of the Act are outlined in Schedule 3 of Annexure A attached to this Certificate.

PART B: NAME OF INSTRUMENT AND LAND ZONING DETAILS
Maclean Local Environmental Plan 2001 zones the land:
1(a) RURAL (AGRICULTURAL PROTECTION) ZONE

CLAUSE 15 APPLIES (SEE ATTACHMENT)

The purposes for which development may be carried out within the zone or zones without development consent and with development consent or the purpose for which the carrying out of development is prohibited within the zone or zones are listed in the extract of Maclean Local Environmental Plan 2001 attached as Annexure B.

PART C: STATE AND REGIONAL ENVIRONMENTAL PLANNING POLICIES
The following matters are specified:

1(a) State Environmental Planning Policies:4,9,20 & 36 are specified (as being generally notified by the Minister for Planning to be specified in the Certificate), as applying to land within the Shire of Maclean including the land to which this Certificate applies. The effect of the Policies (which the Minister has notified the Council should be specified in the Certificate) is outlined in Schedule 2 of Annexure A attached to this Certificate.
(b) Where any other State Environmental Planning Policy (as being specified by the Minister for Planning to be notified in the particular case for land to which a Certificate applies) applies to land to which this Certificate applies and is specified below, the effect of the policy is outlined in Schedule 2 of Annexure A attached to this Certificate.
The following Policy applies: SEPP 71

PART C: cont

2. Draft State Environmental Planning Policies are listed in Schedule 3 of Annexure A attached to this Certificate.
3. North Coast Regional Environmental Plan which specifies :
(I) that the Council is to consult, consider certain matters, and attach conditions before granting consent to particular development on rural and urban land in the North Coast Region.
(ii) That buildings over 14 metres in height require the concurrence of the Director of Planning.

PART D: DEVELOPMENT CONTROL PLANS:
(a) Affecting all properties in the Shire

MACLEAN SHIRE DEVELOPMENT CONTROL PLAN FOR OUTDOOR ADVERTISING
MACLEAN SHIRE DEVELOPMENT CONTROL PLAN (PARKING) ADOPTED
MACLEAN SHIRE DEVELOPMENT CONTROL PLAN FOR NOTIFIED DEVELOPMENT
MACLEAN SHIRE SUBDIVISION GUIDELINES
MACLEAN SHIRE DEVELOPMENT CONTROL PLAN FOR EXEMPT & COMPLYING DEVELOPMENT
MACLEAN SHIRE DEVELOPMENT CONTROL PLAN FOR KEEPING OF PIGS & POULTRY

(b) Affecting specific properties

PALMERS ISLAND RIVERBANK EROSION DCP
RURAL WORKERS DWELLINGS DCP

PART E: GENERAL INFORMATION PROVIDED IN ACCORDANCE WITH SECTION 149(2)

(1) Where land to which this Certificate relates is vacant and, is identified as being within a rural zone, the Council shall not consent to the erection of a dwelling-house (under Maclean Local Environmental Plan 2001) unless the allotment:
(a) has an area of not less than 40 hectares; or
(b) comprises an allotment created by a subdivision in accordance with Clause 32, 33 or 35 of Maclean LEP 2001; or
(c) comprises an allotment on which a dwelling-house could have been erected immediately prior to the appointed day and which could have been created in accordance with the provisions of Clause 32, 33 or 35 if those provisions were in force at the time that the allotment was created; or
(d) comprises an allotment of land that was consented to or approved by the Council prior to the appointed day and on which a dwelling-house could have been lawfully erected immediately prior to the appointed day.

(2) Where land to which this Certificate relates is vacant and, is identified as being within a environmental protection zone, the Council shall not consent to the erection of a dwelling-house (under Maclean Local Environmental Plan 2001) unless the allotment:
(a) has an area of not less than 40 hectares; or
(b) comprises an allotment created by a subdivision in accordance with Clause 58 or 59 of Maclean LEP 2001; or
(c) comprises an allotment on which a dwelling-house could have been erected immediately prior to the appointed day and which could have been created in accordance with the provisions of Clause 58 or 59 if those provisions were in force at the time that the allotment was created; or
(d) comprises an allotment of land that was consented to or approved by the Council prior to the appointed day and on which a dwelling-house could have been lawfully erected immediately prior to the appointed day.

(3) Development consent is required for the demolition of any buildings on the land.

(4) Certain Section 94 Plans apply to this property. Refer to attachment for Section 94 Contribution Plans applicable in the Shire.

(5) Development to which State Environmental Planning Policy No. 34 - Major Employment Generating Industrial Development and State Environmental Planning Policy No. 48 - Major Putrescible Landfill Sites apply is State significant development.

PART E: CONT

Under clause 17(1) of the Environmental Planning and Assessment (Savings and Transitional) Regulation 1998, all s.101 directions in existence before 1 July 1998 are taken to be State significant development. There is a Direction applying to all applications, other than applications by public authorities, in respect of the carrying out of development for the purposes of canals or other artificial waterways whereby all applications are to be referred to the Minister for Planning for determination.

(6) The land is not affected by the operation of Section 38 or 39 of the Coastal Protection Act 1979.

(7) The land has not been proclaimed to be in a mine subsidence district within the meaning of section 159 of the Mine Subsidence Compensation Act 1961.

(8) Affects of any road widening or road realignment under -
(i) Division 2 of Part 3 of the Roads Act 1993 not affected/~~affected~~.
(ii) any environmental planning instrument; not affected/~~affected~~
(iii) any resolution of the Council. not affected/~~affected~~

PART (F): DEVELOPMENT RESTRICTIONS DUE TO THE LIKELIHOOD OF LANDSLIP, BUSHFIRE, FLOODING, TIDAL INUNDATION, SUBSIDENCE OR ANY OTHER RISK AS ADOPTED BY COUNCIL ARE LISTED HEREUNDER:

THE LAND IS FLOOD LIABLE
SUBJECT TO THE PALMERS ISLAND RIVERBANK PLAN

THE PROPERTY (OR A PART OF IT) IS IDENTIFIED ON THE ACID SULFATE SOILS PLANNING MAPS (REFER TO THE MACLEAN LEP 2001) AS POTENTIALLY CONTAINING ACID SULFATE SOILS.

THIS LAND IS IDENTIFIED AS BUSHFIRE PRONE LAND. THIS DESIGNATION IS AN INTERIM ASSESSMENT AND WILL BE REVIEWED ON COMPLETION OF COUNCIL'S "BUSHFIRE PRONE LAND MAPPING" BY 31 JULY 2003.

For all land zoned 1a, 1b, 3a, 4a & 5a the zonings may have permitted past land uses that could give rise to potential site contamination
For further information refer to schedule 1 of annexure A and Council's Contaminated Lands Policy.

PART (G): Section 59 (2) of the Contaminated Land Management Act provides that specific notations relating to contaminated land issues must be included on section 149(2) certificates.

The subject land **is not** subject to a current voluntary agreement, site audit statement, declaration, or order for investigation or remediation issue under the *Contaminated Land Management Act 1997* as notified by the EPA.

SECTION 149(5)

On application to Council and the payment of the prescribed fee, advice is provided in Annexure C pursuant to Section 149(5) on such other relevant matters, affecting the land, of which Council may be aware.

PLEASE NOTE:

The Environmental Planning and Assessment Amendment Act 1997 commenced operation on 1 July 1998. As a consequence of this Act the information contained in this certificate needs to be read in conjunction with the provisions of the Environmental Planning and Assessment (Amendment) Regulation 1998, Environmental Planning and Assessment (Further Amendment)Regulation 1998 and Environmental Planning and Assessment (Savings and Transitional) Regulation 1998.

MR. ROSS BRYANT
GENERAL MANAGER

per TOWN PLANNER

ANNEXURE "A"

For attachment to Certificate under Section 149 Environmental Planning & Assessment Act (Extract from Maclean Local Environmental Plan 2001)

SCHEDULE 1

This Schedule refers to Controls within the relevant planning instrument which restrict or purport to restrict the purposes for which development may be carried out. These controls are not included within the land use table (if applicable) of the relevant instrument. Restrictions applicable pursuant to a zoning of the land (which relates to a land use table) are referred to in Clause (b) of Column 1 of the Certificate.

A. DIVISION 1 - SUBDIVISION OF LAND

A person shall not subdivide land without the consent of the Council excepting for opening or widening a public road, a boundary adjustment that does not involve the creation of an additional allotment, rectifying an encroachment, creating a public reserve, consolidating allotments and excising an allotment for public purposes.

Controls apply for subdivision in Maclean Local Environmental Plan 2001 which vary according to zoning. For rural zonings subdivision controls see Clauses 32, 33, 34, and 35; for residential, business and industrial zones see Clauses 47 and 48; for special use and open space zones see Clause 54 ; for environmental protection zones see Clauses 58 and 59.

B. DIVISION 2 - DWELLING HOUSES AND DUPLEXES

Controls apply for the construction of dwelling houses and duplexes in all rural and environmental protection zones and for the construction of rural workers dwellings in all rural zones.

C. DIVISION 3 - ENVIRONMENTAL PROTECTION

Controls apply for development within: all environmental protection zones generally; Zones No 7(e) Environmental Protection (Escarpment/Scenic) and on ridgelines specifically; Zone No 7(c) Environmental Protection (Coastal Foreshore) specifically; land within Mangrove Creek catchment area; and land in the vicinity of waterways and Special Emphasis Areas.

D. DIVISION 4 - GEOLOGICAL RESOURCES

Controls apply to certain areas for the protection of economic geological resources. A control also applies over the development of land for mineral sand mining within Zones Nos 1(a), 1(b), 1(f), 1(i), 1(r) and 1(s).

E. DIVISION 5 - LAND ACQUISITION

Controls apply pertaining to the acquisition of land, by relevant authorities: within Zones Nos 6(b), 6(c) or 8(b); and for certain land for road purposes indicated on the Local Environmental Plan map by medium grey shading or by horizontal and vertical cross hatching and extending as road widening or relocation between Oyster Channel and Coldstream Street, Yamba.

F. DIVISION 6 - HERITAGE ITEMS

Properties which contain a heritage item or **are in the vicinity of** a heritage item are affected by Part 2 of the Maclean LEP 2001 which places restrictions on the development of the property and you are urged to refer to the provisions of that Part. These restrictions apply to the specific items listed in Schedule 1 of Maclean Local Environmental Plan 2001 and Aboriginal Conservation Areas identified within the publication "Aboriginal Archaeological Sites in the Shire of Maclean: A Heritage Study" by Denis Byrne.

G. DIVISION 7 - GENERAL DEVELOPMENT CONTROLS

General Development controls apply and are contained in Part 1 of Maclean Local Environmental Plan 2001 and include the following:

(a) Development of land at boundaries of adjoining zones (Clause 9);

(b) Development along main or arterial roads. The roads are indicated on the Local Environmental Plan maps (Clause 19).

(c) Development in the vicinity of waterways (Clause 12);

(d) Development within the coastal zone (Clause 13);

(e) Foreshore building lines where fixed by Council (Clause 14);

(f) Suspension of certain covenants (any agreement, covenant or similar instrument which purports to impose restrictions on the carrying out of development) (Clause 8);

(g) Exempt development (Clause 16);

(h) Complying development (Clause 17);

(i) Development on land identified on the Acid Sulphate Soils Planning maps (Clause 18)

H. DIVISION 8 - HAZARD CONTROLS

(i) Bushfire hazard

Clause 10 of Maclean Local Environmental Plan 2001 states that consent must not be granted to development of land within Maclean Shire unless the Council is satisfied that adequate provision has been or will be made for the reduction of bushfire hazard.

(ii) Flood liable land

Controls relating to land which is flood liable and within a floodway, where development on the land (or land in the immediate vicinity) is likely to adversely impede flood waters, imperil the safety of persons in the event of inundation with flood waters, aggravate the consequence of lying floodwaters with regard to erosion, siltation or destruction of vegetation or adversely effect the water table,

Clause 11 of the Local Environmental Plan 2001 states:

The Council shall not grant consent to the erection of a dwelling on flood liable land unless the floor level of the living accommodation of the dwelling is located-

(a) in the case of land within Zone No. 2(a), 2(b), 2(t), 3(a) or 4(a) within the towns of Iluka or Yamba, at least 0.3 metres above the 1 in 100 year flood level adopted by the Council; and

(b) in the case of all other land, at least 0.5 metres above the 1 in 100 year flood level adopted by the Council.

Where any development on land affects flood mitigation works carried out by the Clarence River county Council, Council shall, before determining an application take into consideration the representations from that County Council.

Where the land is identified in a Certificate as flood liable, an owner of land should obtain survey levels over the land, including any improvements on the land, in order to ascertain how the land including any improvements may be affected by the adopted 1 in 100 year flood level, or, contact Council's Engineering Department for further information. The depth of inundation will vary from area to area and land may only be minimally affected in some areas, depending upon the existing natural ground levels, or where filling has taken place.

Further, any person relying upon information furnished in this Certificate should not assume that any improvements which have been erected on flood liable land have been so erected above the 1 in 100 year flood level, and in this respect, appropriate professional advice should be obtained.

(iii) Dip sites

Where the land contains a contaminated dip site or the land is within 200 metres of a contaminated dip site Council will not approve any development on the land without a risk assessment being first carried out and will then only permit development which is compatible with the findings of that risk assessment.

(iv) Palmers Island riverbank erosion

The riverbank in the vicinity of Palmers Island village is in immediate danger of collapse. Council has prepared a Management Plan relating to that section of riverbank and development within that area is subject to clause 15 in the Maclean LEP 2001 and to Maclean Council Development Control Plan No 43 which severely restrict development. You are urged to refer to all these documents.

(v) Slope instability at Marine Parade Yamba

Parts of this slope have been identified as being at risk of failure due to slope instability. Council requires any application for any development of that slope to be accompanied by a geotechnical report prepared at the applicant's expense.

(vi) Contaminated Land

Council has adopted a policy on contaminated land. This policy will restrict development of land:

1. Which is affected by contamination;
2. Which has been used for certain purposes;
3. In respect of which there is not sufficient information about contamination;
4. Which is proposed to be used for certain purposes
5. In other circumstances outlined in the policy

Where Council records indicate that the land in question is potentially or actually contaminated. Council's policy on Contaminated Land and the provisions of relevant State legislation are applicable. Interested persons should make their own enquiries regarding the extent of any actual contamination of the land.

Where Council records do not have sufficient information about previous use of this land to determine if the land is contaminated, consideration by the applicant of Council's policy on Contaminated land and relevant State legislation is warranted. Interested persons should make their own enquiries regarding the extent of any actual contamination of the land.

Where a site has been previously contaminated and remediated, Council may have details of the remediation works. Interested persons should make further enquiries in this regard.

Definitions - Potentially Contaminated Land – Land which may have been used for a land use referred to in Appendix 1 of Council's Contaminated Lands Policy.

(vii) **Acid Sulfate Soils**

Where land is identified on the Acid Sulfate Soils Planning Maps forming part of the Maclean LEP 2001 as containing acid sulfate soils, clause 18 of the LEP applies. Prior to any development being undertaken on the land, Council may require that a preliminary assessment be undertaken, a management plan prepared and development consent obtained.

I. DIVISION 9 - DEVELOPMENT IN CERTAIN AREAS

Development Controls apply over development within Certain Zones and areas as follows:

(a) land within Zone No.8(b) – (Clause 67)

(b) development within Zone No.1(i) Rural (Investigation). In considering any development application Council shall consider the land capability of the land; the demand for the development of the land; whether the land can be serviced with water, sewerage and local road and the likely future road network; the strategic implication of the development of the land (in terms of any Land Release Strategy or Clarence Valley Settlement Strategy); and the conservation values of the land, as they relate to likely future uses of the land. (Clause 42).

(c) certain land at Brooms Head and Iluka. There is a need for reticulated sewerage treatment, of areas shown on the Local Environmental Plan maps, for the subdivision of the land. Clause 44 and 52.

(d) CROWN ROADS:- Council is not necessarily responsible for providing access to properties serviced by a Crown road or maintaining these roads. If the property to which this Certificate relates, gains access via a Crown road or, it appears that access can only be gained via a Crown road reserve, further enquiries should be made to Council's Engineering Services Department to determine the extent (if any) of Council's responsibility.

J. TREE PRESERVATION ORDER

In pursuance of clause 8 of the Model Provisions as adopted by cl.5 of the Maclean LEP, 2001, Council has resolved that a tree preservation order shall apply to certain lands within Maclean Shire.

Species to which this order applies:-

Scientific name	Common name
Eucalyptus tereticornis	Forest Red Gum
Eucalyptus microcorys	Tallowwood
Eucalyptus robusta	Swamp Mahogany
Eucalyptus propinqua	Small-fruited Grey Gum
Corymbia intermedia	Pink Bloodwood
Lophostemon confertus	Brush Box
Eucalyptus biturbinata	Grey Gum
Eucalyptus saligna	Sydney Blue Gum
Eucalyptus acmenoides	White mahogany
Eucalyptus seeana	Narrow leaved Red Gum
Eucalyptus maculata	Spotted Gum
Eucalyptus henryi	Large leaved Spotted Gum
Eucalyptus signata	Northern Scribbly Gum
Eucalyptus grandis	Flooded Gum
Ficus macrophylla	Moreton Bay Fig

If you propose to destroy or lop any of the tree species listed above, you are advised to first contact Council.

SCHEDULE 2

STATE ENVIRONMENTAL PLANNING POLICIES

No. 1 Development Standards

This Policy provides flexibility in the application of planning controls operating by virtue of development standards In circumstances where strict compliance with those standards would, in any particular case, be unreasonable or unnecessary or tend to hinder the attainment of the objects specified in Section 5 (a) (i) and (ii) of the Act.

No. 4C Development Without Consent

This Policy is designed to permit development for a purpose which is of minor environmental significance, development for certain purposes by public utility undertakings and development on certain land reserved or dedicated under the National Parks and Wildlife Act 1974 without the necessity for development consent being obtained therefore, where:

(a) the carrying out of that development is not prohibited under the Act, except by reason only of a requirement for the obtaining of development consent before that development may be carried out, and

(b) the development is carried out in accordance with any development standard applying in respect of the development,

but without affecting any requirement to obtain consent or approval under any other Act in respect of the carrying out of development.

No. 9 Group Homes.

Controls the development of group homes on all land where dwellings are allowed.

No. 14 Coastal Wetlands.

Provides that certain lands in coastal local government areas (except those in Sydney Metropolitan Area) shall not be cleared, drained or filled or have a levee constructed on them without the consent of the Council.

No. 15 Rural Land Sharing Communities

This Policy aims:

(a) to encourage and facilitate the development of rural landsharing communities committed to environmentally sensitive and sustainable land use practices, and thus

(b) to enable:

- people to collectively own a single allotment of land and use it as their principal place of residence, and
- the erection of multiple dwellings on the allotment and the sharing of facilities and resources to collectively manage the allotment, and
- the pooling of resources, particularly where low incomes are involved, to economically develop a wide range of communal rural living opportunities, including the construction of low cost buildings, and

c) to facilitate development, preferably in a clustered style

No. 21 Caravan Parks

The aim of this policy is to encourage the orderly and economic use and development of land used or intended to be used as a caravan park catering exclusively or predominantly for short-term residents (such as tourists) or for long-term residents, or catering for both.

No. 22 Shops and Commercial Premises

The aim of this policy is to permit within a business zone:

c) the change of use of a building lawfully used for a particular kind of commercial premises to another kind of commercial premises or to a shop: or

d) the change of use of a building lawfully used for a particular kind of shop to another kind of shop or to a commercial premises, even though that change of use is prohibited under another environmental planning instrument, if

e) the consent authority is satisfied the change of use will not have more than a minor environmental effect and is in keeping with the objectives (if any) of the zone; and

f) development consent is obtained for the change of use from that consent authority.

No. 26 Littoral Rainforests.

Imposes strict controls on any development or any activity carried out or undertaken of land which is affected by it, including the necessity to obtain the consent of the Council and the concurrence of the Director of Planning before any such development or activity may be carried out on that land.

No.30C Intensive Agriculture

This Policy requires development consent for cattle feedlots having a capacity to accommodate 50 or more head of cattle, and piggeries having a capacity to accommodate 200 or more pigs or 20 or more breeding sows This Policy also extends

the definition of the term 'rural industry' to include composting facilities and works, including facilities and works for the production of mushroom substrate.

No.33 Hazardous and Offensive Development

This Policy aims:

(a) to amend the definitions of hazardous and offensive industries where used in environmental planning instruments; and

(b) to render ineffective a provision of any environmental planning instrument that prohibits development for the purposes of a storage facility on the ground that the facility is hazardous or offensive if it is not a hazardous or offensive storage establishment as defined in this Policy; and

(c) to require development consent for hazardous or offensive development proposed to be carried out in the Western Division; and

(d) to ensure that in determining whether a development is a hazardous of offensive industry, any measures proposed to be employed to reduce the impact of the development are taken into account; and

(e) to ensure that in considering any application to carry out potentially hazardous or offensive development, the consent authority has sufficient information to assess whether the development is hazardous or offensive and to impose conditions to reduce or minimise any adverse impact; and

(f) to require the advertising of applications to carry out any such development

No.34 Major Employment Generating Industrial Development

The aims of this Policy are:

(a) to promote and co-ordinate the orderly and economic use and development of land and the economic welfare of the State: and

(b) to facilitate certain types of major employment-generating industrial development and labour intensive rural industrial development.

No.35 Maintenance Dredging of Tidal Waterways

The objective of this Policy is to enable the maintenance dredging of tidal waterways by public authorities to be carried out in a timely, cost effective and environmentally responsible manner.

No. 36 Manufactured Home Estates.

(a) Defines where Manufactured Home Estates (MHEs) may be permitted and establishes criteria for the granting of development consent to these estates.

(b) Enables, with development consent, the subdivision of MHEs, provided such subdivision complies with the provisions of the Local Government (Manufactured Home Estates) Regulation 1993.

No. 37 Continued Mines & Extractive Industries

The objectives of this Policy are:

(a) to promote and safeguard the orderly and economic use of land for the purpose of mines and extractive industries and:

(b) to enable certain existing mines and extractive industries to continue to operate subject to appropriate environmental assessment and to specify the circumstances in which development consent for them may be obtained.

No. 44c Koala Habitat Protection

This Policy aims to encourage the proper conservation and management of areas of natural vegetation that provide habitat for koalas to ensure a permanent free-living population over their present range and reverse the current trend of koala population decline:

(a) by requiring the preparation of plans of management before development consent can be granted in relation to areas of core koala habitat; and

(b) by encouraging the identification of areas of core koala habitat; and

(c) by encouraging the inclusion of areas of core koala habitat in environment protection zones.

No. 45 Permissibility of Mining

This Policy removes the effect of certain provisions in environmental planning instruments that might, in the absence of this Policy, be relevant to:

(a) the determination of whether or not a proposed development for the purposes of mining is permissible with development consent (including provisions that might otherwise require a consent authority to be satisfied as to certain matters before determining that mining is permissible with development consent); and

(b) the determination of development applications for consent to carry out development for the purposes of mining.

No. 48 Major Putrescible Landfill Sites

The aims of this Policy are:

(a) to provide for the assessment and determination of proposals for major putrescible landfill sites:

(i) in a way that will ensure a consistency of approach: and

(ii) so as to ensure that the significance of the proposals to the State is taken into account; and

(b) to ensure that the use of landfill sites as a means of waste disposal is weighed against other waste management and waste disposal alternatives.

No. 50 Canal Estate Development

This Policy aims to prohibit canal estate development in order to ensure that the environment is not adversely affected by the creation of new developments of this kind.

No. 55 Remediation of Land

State Environmental Planning Policy No. 55 - Remediation of Land aims to promote the remediation of contaminated land for the purpose of reducing the risk of harm to human health or any other aspect of the environment. The policy applies to the whole state, to ensure that remediation is permissible development and is always carried out to a high standard. It specifies when consent is required for remediation and lists considerations that are relevant when rezoning land and determining development applications.

No. 71 Coastal Protection

This Policy applies to land within the coastal zone as defined in the Coastal Protection Act, generally being one kilometre from the coast, estuary, coastal lake or tidal river. The Policy makes the Minister the consent authority for major high-risk development proposals within the coastal zone, and defines a category and development assessment process for development in sensitive coastal locations.

SCHEDULE 3

Draft State Environmental Planning Policies.

Nil

Draft Local Environmental Plans.

Where a Draft State Environmental Planning Policy or a Draft Local Environmental Plan affects the property to which this Certificate applies, copies of the relevant documents are available at Council's office.

ANNEXURE B

For attachment to Certificate under Section 149 Environmental Planning & Assessment Act
(Extract from Maclean Local Environmental Plan 2001)

Zone No 1 (a) Rural (Agricultural Protection) Zone

1 Aim of zone

The primary aims of this zone are to protect, reserve and encourage the use of land is this zone for agriculture and uses compatible with agriculture.

2 Objectives of zone

The particular objectives of this zone are:
(a) to conserve the productive potential of prime crop or pasture land, and
(b) to provide for new forms of agricultural development, and changing patterns of existing agricultural development, and
(c) to ensure that commercial farming is not affected adversely by incompatible uses which impair its long term sustainability, and
(d) to avoid degradation and alienation of prime agricultural land, and
(e) to enable rural tourism, which does not adversely affect the productive potential of the land, and
(f) to exclude urban development on all prime crop or pasture land, and
(g) to restrict the subdivision of prime crop or pasture land, and
(h) to encourage conservation in farming practices, and
(i) to control the clearing of vegetation and encourage the retention of vegetation.

3 Without development consent

Development for the purpose of:

Agriculture (other than intensive animal husbandry); ancillary removal of native vegetation; bushfire control; clearing not included in item 4; dams with a capacity of 2 megalitres or less, or dams requiring licensing under Part 2 of the *Water Act 1912*; flood mitigation works; forestry; jetties with a maximum of 2 vessels used for private use; public utility undertakings.

Exempt development.

4 Only with development consent

Development for the purpose of:

Aquaculture; bus stations; clear felling; clearing allowed only with consent under clause 40; cluster farming; dams not included in item 3, duplexes; dwelling houses; general stores; home industries; intensive animal husbandry; liquid fuel depots; livestock keeping establishments; professional consulting rooms; roadside stalls; rural industries; rural tourist facilities; rural workers' dwellings.

Any other development not included in item 3 or 5.

Note. Consent for development included in this item will be refused if the proposed development is not consistent with the objectives of the zone.

5 Prohibited

Development for the purpose of:

Caravan parks; commercial premises; educational establishments; institutions; motor showrooms; places of assembly; recreation vehicle areas; residential flat buildings; shops (other than general stores); taverns; total destination resorts; tourist facilities; transport terminals; units for aged persons; warehouses.

Attachment to Certificate under Section 149(2) & (5)

SECTION 94 CONTRIBUTION PLANS

The following Section 94 Contribution Plans are operative throughout the Shire and apply to all new subdivisions or multiple occupancy development except as otherwise stated.

(1) OPEN SPACE/RECREATION FACILITIES:

Applies to all properties within the Shire.

(2) COMMUNITY AMENITIES AND SERVICES:

Applies to all properties within the Shire.

(3) RURAL ROADS:

Applies to all rural areas.

(4) STREET TREES:

Applies to all residential areas.

(5) CRISP DRIVE ASHBY:

Refers to the Crisp Drive Ashby area and applies to all new subdivisions.

Multiple occupancy developments will not be affected by this plan.

(6) PHOTOGRAMMETRIC MAPPING:

Refers to the Ashby, Gulmarrad and Woombah areas and applies to all new subdivisions.

(7) ASHBY PENINSULA RING ROAD:

Refers to the Ashby Peninsula area in the vicinity of Old Ferry Road and Pateman's Road. This plan will affect all new subdivisions, resubdivisions and multiple occupancy developments.

(8) CARPARKING IN THE MACLEAN, YAMBA AND ILUKA CBDs

Applies to all properties in the Central Business Districts

(9) YAMBA URBAN BYPASS & URBAN INTERSECTIONS

Applies to Yamba and surrounding areas including Micalo Island, Palmers Island, Angourie and Wooloweyah.

(10) QUARRY ROAD MAINTENANCE

Applies to roads within the Shire used by extractive industries.

(11) YAMBA DRAINAGE CATCHMENTS

Applies to properties in the vicinity of the Yamba CBD

LIVING WITH PRIMARY INDUSTRY

Maclean Shire is situated approximately 700 kilometres north of Sydney and 300 kilometres south of Brisbane. Maclean Shire is principally a rural shire of 1041 square kilometres, with Maclean as its administrative centre. The area has a population of 15,987. The major primary industries in the shire are sugar and fishing.

Sugar cane is grown on the floodplain areas of the Lower Clarence Valley. The harvested sugar cane is transported by road to the Harwood Sugar Mill and Refinery where it is processed into raw sugar, refined sugar and molasses. All the sugar cane harvested in New South Wales is transported to the Harwood Sugar Refinery for processing.

Commercial fishing is carried out both in the Clarence River and the open sea. The major fishing fleets being at Iluka, Yamba and Maclean. Individual trawlers are also moored at various locations in Clarence River waterways. The techniques used to catch fish range from mesh netting of fish, trapping of crabs to trawling for prawns in the river and at sea and hauling of the beaches.

The Shire population is concentrated in the main town centres of Iluka, Maclean and Yamba. Smaller villages and individual residences are located throughout the rural area. A growing number of people are being attracted to the scenic beauty and tranquillity around the smaller villages and in rural areas.

When we choose to live in rural areas or near areas where fishing trawlers operate we have to accept the activities of these industries. Viable primary industry activities cannot be limited because an increased number of people choose to live amongst them.

These primary industries may cause residents some inconvenience from time to time as an unavoidable consequence of their operation, dust noise, odours, etc, are all part of primary industry. Any inconvenience would not be continuous, and would normally occur on a seasonal basis.

It is essential when considering the purchase of property, that purchasers familiarise themselves with the possible seasonal primary industry activities which may impact on the property.
Some of the activities that may be encountered in rural areas within Maclean Shire area are listed below:-

Aerial spraying
Animal husbandry practices (castration, dehorning etc.)
Burning of cane fields
Bushfire hazard reduction burning
Clearing and cultivation of land
Commercial fishing
Construction of access roads and tracks

Construction of dams, drains and contour banks
Driving of live stock on roads
Fencing
Fishing trawler operation
Haulage of rural produce
Herbicide spraying
Intensive livestock waste disposal systems and ponds
Logging and milling of timber
Livestock feed lots
Machinery repairs
Pesticide spraying
Planting of woodlots
Pumping and irrigation
Silage production
Slashing and mowing vegetation
Use of agricultural machinery (tractors, chainsaws, motor bikes etc)

15 Development within river bank erosion localities

(1) This clause applies to all land adjacent to the Clarence River, as shown edged with heavy black broken and unbroken lines on the map marked "Maclean Local Environmental Plan 1992 (Amendment No 7)". That map is referred to in this clause as ***the river bank map***.

(2) The aims of this clause are:

(a) to identify land at Palmers Island fronting the Clarence River or its tributaries which is subject to a risk of major river bank erosion, and

(b) to restrict development on any such land, and

(c) to allow more detailed provisions to be made by means of a development control plan for the control of development of any such land.

(3) A person must not carry out any development on, or subdivide, land to which this clause applies, except with development consent.

(4) Consent must not be granted to the erection of a building on land to which this clause applies shown cross-hatched and edged with a broken black line on the river bank map.

(5) However, a person may, with development consent, repair or rebuild a building erected before this clause commenced on land to which subclause (4) applies, but only if the building has been partially destroyed by accident or by damage caused otherwise than by river bank erosion. If any such building is totally destroyed, its rebuilding is prohibited.

(6) Consent may be granted to such repairing or rebuilding only if:

(a) the total floor area of the building after it has been carried out will be no greater than its total floor area prior to the accident or damage, and

(b) where possible, the building will be relocated (when it is rebuilt or repaired) to a location on the land as far as is practicable from the river bank erosion escarpment, and

(c) the repairing or rebuilding will be carried out within 12 months after the date when the accident or damage occurred.

(7) Consent must not be granted to the carrying out of any development on, or subdivision of, land to which this clause applies shown stippled and edged with a broken black line on the river bank map unless the consent authority has taken into consideration the following:

(a) the likelihood of the proposed development adversely affecting, or being adversely affected by, river bank erosion and flooding,

(b) the need to relocate buildings in the long-term,

(c) the need for the proposed development to be limited to a specified period of time,

(d) the nature, bulk and intensity of the proposed development,

(e) the provisions of any development control plan relating to development of the land or other land in the locality,

(f) whether adequate safeguards and measures have been or will be in place to protect the environment and mitigate the risk of property damage or loss of life as a result of river bank erosion and flooding,

(g) whether satisfactory arrangements will be made for access, during a flood and after river bank erosion, to and from the site of any building or work resulting from the proposed development.

(8) A person may carry out development to protect land to which this clause applies from river bank erosion or flooding only with development consent.

APPENDIX B

GEOLOGICAL BORELOGS

LOCATION See Figure 2		Borehole No. BH1 LOGGED BY HMc	Project Manager HMc
SURFACE ELEVATION (RL)	JOB No. 50212		
GROUNDWATER As shown	DATUM	PROJECT Palmers Island 19 River Road NSW	Approved
DRILL TYPE/METHOD H/A	DATE 17/12/02		

#No.	STRATIGRAPHY	GRAPHIC LOG	Depth metres	SAMPLES TYPE	SAMPLES undisturbed disturbed lost	Moisture content %	FID Background	FID Reading ppm	CHEMICAL DATA pH - soil	pH - H2O	pe - H2O	EC uS/cm	CONSTRUCTION DETAILS / COMMENTS
BH1	Natural – Silty Clay, loose, brown, with charcoal & roots (OL)		0	P		D			4				No odour throughout
	Medium Clay – Dark brown, with brown/orange mottling & charcoal		0.2	P		D			4.5				
	Sandy Clay – Grey with brown mottling		0.6	P					6				NGWE
	Medium Sand – Grey		0.8	P		D-M			5.5				
	Medium Sand – Grey with large amount of brown/orange mottling		1.0	P		M			5.5				
	Medium Sand – Grey		1.2			W			5.5				
	E.O.H. @ 1.4m in Natural Medium grey Sand.		1.4										
			1.6										
			1.8										
			2.0										

LOCATION See Figure 2		Borehole No. BH53 ..... LOGGED BY HMc	Project Manager HMc
SURFACE ELEVATION (RL)	JOB No. 50212		
GROUNDWATER As shown	DATUM	PROJECT Palmers Island 19 River Road NSW	Approved .....
DRILL TYPE/METHOD H/A	DATE 17/12/02		

#No.	STRATIGRAPHY	GRAPHIC LOG	Depth metres	SAMPLES TYPE	SAMPLES undisturbed	SAMPLES disturbed	SAMPLES lost	Moisture content %	FID Background	FID Reading ppm	CHEMICAL DATA pH - soil	CHEMICAL DATA pH - H2O	CHEMICAL DATA ρe - H2O	CHEMICAL DATA EC uS/cm	CONSTRUCTION DETAILS COMMENTS
BH53	Natural – Silty Clay, loose, brown with roots & charcoal (OL)		0	P				D			4.5				No odour throughout
	Medium Clay – Dark brown with orange mottling & charcoal		0.2	P				D-M			4.5				
	Medium Clay – Grey with charcoal		0.4	P				M			4.5				
	Sandy Clay – Grey		0.6	P				M			4.5				NGWE
	Medium Sand – Grey with large amount of brown/orange mottling		1.0	P				W			4.5				
	E.O.H. @ 1.8m in Natural wet grey Medium Sand with brown/orange mottles		1.2												
			1.4												
			1.6												
			1.8												
			2.0												

LOCATION See Figure 2		Borehole No. BH106 LOGGED BY HMc	Project Manager HMc
SURFACE ELEVATION (RL)	JOB No. 50212		
GROUNDWATER As shown	DATUM	PROJECT Palmers Island 19 River Road NSW	Approved
DRILL TYPE/METHOD H/A	DATE 17/12/02		

#No.	STRATIGRAPHY	GRAPHIC LOG	Depth metres	SAMPLES TYPE	SAMPLES undisturbed disturbed lost	Moisture content %	FID Background	FID Reading ppm	CHEMICAL DATA pH - soil	pH - H2O	pe - H2O	EC uS/cm	CONSTRUCTION DETAILS / COMMENTS
BH106	Natural – Silty Clay, loose, brown with roots & charcoal (OL)		0	P		D			5.5				No odour throughout
	Medium Clay – Dark brown with brown/orange mottling		1.0	P		D			4.5				NGWE
	Medium Clay – Grey with brown/ orange mottling		1.2	P		D-M			5				
	Sandy Clay – Grey with brown/ orange mottling		1.6	P		M			5.5				
	Medium Sand – Grey with large amount of brown/orange mottling		1.8	P		W			5.5				
	E.O.H. @ 2.0m in Natural grey Medium Sand with brown/orange mottles		2.0										

LOCATION See Figure 2		Borehole No. SS2-SS110 LOGGED BY HMc	Project Manager HMc
SURFACE ELEVATION (RL)	JOB No. 50212		
GROUNDWATER As shown	DATUM	PROJECT Palmers Island 19 River Road NSW	Approved
DRILL TYPE/METHOD H/A	DATE 17/12/02		

#No.	STRATIGRAPHY	GRAPHIC LOG	Depth metres	SAMPLES TYPE	SAMPLES undisturbed disturbed lost	Moisture content %	FID Background	FID Reading ppm	CHEMICAL DATA pH - soil	pH - H2O	pe - H2O	EC uS/cm	CONSTRUCTION DETAILS / COMMENTS
			0										
SS2	SILTY CLAY - loose,brown,roots,charcoal (OL)			P		Dry-Moist			5				No odours
SS3	As above								5.5				
SS4	As above								5.5				
SS5	As above								6.5				
SS6	As above								6				
SS7	As above								6.5				
SS8-SS10	As above								5.5				
SS11	As above								5				
SS12	As above								5.5				
SS13	As above								5				
SS14	As above								5.5				
SS15	As above								6				
SS16	As above								4				
SS17-SS26	As above								5.5				
SS27	As above								5				
SS28	As above								5.5				
SS29-SS35	As above								5.5				
SS36	As above								5				
SS37-SS40	As above								5.5				
SS41-SS43	As above								5				
SS44	As above								5.5				
SS45-SS63	As above								5				
SS64	As above shell fragments								7.5				
SS65	As above shell fragments								7				
SS66	As above minor shell fragments								6				
SS67-SS70	As above								5.5				
SS71-SS79	As above								5				
SS80-SS81	As above								5.5				
SS82-SS85	As above								5				
SS86	As above								5.5				
SS87 - SS105	As above								5				
SS107 - SS109	As above								5.5				
SS110	As above			V		V			6				V

APPENDIX C

LABORATORY TRANSCRIPTS

CHECKED

AGAL

REPORT OF ANALYSIS

Report No. RN334803

Client	: ENVIRONMENTAL & EARTH SCIENCES PO BOX 380 NORTH SYDNEY NSW 2059	**Job No.** **Quote No.** **Order No.** **Date Sampled** **Date Received**	: ENVI10/021219 : QT-00500 : : : 19-DEC-2002
Attention	: HUGH MCCAFFERY	**Sampled By**	: CLIENT
Project Name	:		
Your Client Services Manager	: BRIAN WOODWARD	**Phone**	: (02) 94490151

Lab Reg No.	Sample Ref	Sample Description
N02/042034	CS1	SOIL PALMERS ISLAND JOB 50212 COMP BH1 (0-0.1M), SS10, SS11, SS20
N02/042035	CS3	SOIL PALMERS ISLAND JOB 50212 COMP SS3, SS8, SS13, SS18
N02/042036	CS8	SOIL PALMERS ISLAND JOB 50212 COMP SS25, SS26, SS35, SS36
N02/042037	CS9	SOIL PALMERS ISLAND JOB 50212 COMP SS31, SS40, SS41, SS50

Lab Reg No. / Sample Reference	Units	N02/042034 CS1	N02/042035 CS3	N02/042036 CS8	N02/042037 CS9	Method
Trace Elements						
Total Solids	%	83.5	83.4	84.6	82.3	NT2_49

Signed:

Dr. Honway Louie, Trace Elements - NSW

Date: 13-JAN-2003

Lab Reg No. / Sample Reference	Units	N02/042034 CS1	N02/042035 CS3	N02/042036 CS8	N02/042037 CS9	Method
Organochlorine (OC) Pesticides						
HCB	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
gamma BHC (Lindane)	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
Heptachlor	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
Aldrin	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
BHC(other than g-BHC)	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
Heptachlor epoxide	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
Chlordane (trans and cis)	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
DDE	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
Dieldrin	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
Endrin	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
DDD	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
DDT	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
Methoxychlor	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
Total Endosulfan	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19

AGAL

REPORT OF ANALYSIS

Report No. RN334803

Lab Reg No.		N02/042034	N02/042035	N02/042036	N02/042037	
Sample Reference	Units	CS1	CS3	CS8	CS9	Method
Surrogate						
Surrogate OC Rec.	%	100	100	100	104	NR_19
Dates						
Date extracted		23-DEC-2002	23-DEC-2002	23-DEC-2002	23-DEC-2002	
Date analysed		23-DEC-2002	23-DEC-2002	23-DEC-2002	23-DEC-2002	

Signed:

Danny Slee, Environmental Residues - NSW

Date: 13-JAN-2003

AGAL

REPORT OF ANALYSIS

Report No. RN334803

Client	: ENVIRONMENTAL & EARTH SCIENCES PO BOX 380 NORTH SYDNEY NSW 2059	**Job No.** **Quote No.** **Order No.** **Date Sampled** **Date Received**	: ENVI10/021219 : QT-00500 : : : 19-DEC-2002
Attention	: HUGH MCCAFFERY	**Sampled By**	: CLIENT
Project Name	:		
Your Client Services Manager	: BRIAN WOODWARD	**Phone**	: (02) 94490151

Lab Reg No.	Sample Ref	Sample Description
N02/042038	CS11	SOIL PALMERS ISLAND JOB 50212 COMP SS33, SS38, SS43, SS48
N02/042039	CS13	SOIL PALMERS ISLAND JOB 50212 COMP SS46, SS55, SS56, SS65
N02/042040	CS14	SOIL PALMERS ISLAND JOB 50212 COMP SS60, SS61, SS70, SS71
N02/042041	CS16	SOIL PALMERS ISLAND JOB 50212 COMP SS58, SS63, SS68, SS73

Lab Reg No.		N02/042038	N02/042039	N02/042040	N02/042041	
Sample Reference	Units	CS11	CS13	CS14	CS16	Method
Trace Elements						
Total Solids	%	83.5	85	82.1	86.1	NT2_49

Signed:

Dr. Honway Louie, Trace Elements - NSW

Date: 13-JAN-2003

Lab Reg No.		N02/042038	N02/042039	N02/042040	N02/042041	
Sample Reference	Units	CS11	CS13	CS14	CS16	Method
Organochlorine (OC) Pesticides						
HCB	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
gamma BHC (Lindane)	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
Heptachlor	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
Aldrin	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
BHC(other than g-BHC)	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
Heptachlor epoxide	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
Chlordane (trans and cis)	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
DDE	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
Dieldrin	mg/kg	0.011	<0.010	0.012	<0.010	NR_19
Endrin	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
DDD	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
DDT	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
Methoxychlor	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
Total Endosulfan	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19

AGAL

REPORT OF ANALYSIS

Report No. RN334803

Lab Reg No.		N02/042038	N02/042039	N02/042040	N02/042041	
Sample Reference	Units	CS11	CS13	CS14	CS16	Method
Surrogate						
Surrogate OC Rec.	%	109	106	101	103	NR_19
Dates						
Date extracted		23-DEC-2002	23-DEC-2002	23-DEC-2002	23-DEC-2002	
Date analysed		23-DEC-2002	23-DEC-2002	23-DEC-2002	23-DEC-2002	

Signed:

Danny Slee, Environmental Residues - NSW

Date: 13-JAN-2003

AGAL

REPORT OF ANALYSIS

Client	: ENVIRONMENTAL & EARTH SCIENCES PO BOX 380 NORTH SYDNEY NSW 2059	**Job No.** **Quote No.** **Order No.** **Date Sampled** **Date Received**	: ENVI10/021219 : QT-00500 : : : 19-DEC-2002
Attention	: HUGH MCCAFFERY	**Sampled By**	: CLIENT
Project Name	:		
Your Client Services Manager	: BRIAN WOODWARD	**Phone**	: (02) 94490151

Lab Reg No.	Sample Ref	Sample Description
N02/042042	CS21	SOIL PALMERS ISLAND JOB 50212 COMP SS91, SS100, SS101, SS110
N02/042043	CS23	SOIL PALMERS ISLAND JOB 50212 COMP SS83, SS88, SS93, SS98
N02/042044	CS25	SOIL PALMERS ISLAND JOB 50212 COMP SS95, SS96, SS105, BH106 (0-0.1M)
N02/042045	SS51	SOIL PALMERS ISLAND JOB 50212

Lab Reg No. Sample Reference	Units	N02/042042 CS21	N02/042043 CS23	N02/042044 CS25	N02/042045 SS51	Method
Trace Elements						
Total Solids	%	86.2	82.4	88.3	81.7	NT2_49

Signed:

Dr. Hon Kay Lowe, Trace Elements - NSW

Date: 13-JAN-2003

Lab Reg No. Sample Reference	Units	N02/042042 CS21	N02/042043 CS23	N02/042044 CS25	N02/042045 SS51	Method
Organochlorine (OC) Pesticides						
HCB	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
gamma BHC (Lindane)	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
Heptachlor	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
Aldrin	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
BHC(other than g-BHC)	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
Heptachlor epoxide	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
Chlordane (trans and cis)	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
DDE	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
Dieldrin	mg/kg	<0.010	<0.010	<0.010	0.011	NR_19
Endrin	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
DDD	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
DDT	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
Methoxychlor	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
Total Endosulfan	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
Surrogate						
Surrogate OC Rec.	%	103	102	110	103	NR_19

AGAL

REPORT OF ANALYSIS

Report No. RN334803

Lab Reg No.	Units	N02/042042	N02/042043	N02/042044	N02/042045	Method
Sample Reference		CS21	CS23	CS25	SS51	
Dates						
Date extracted		23-DEC-2002	23-DEC-2002	23-DEC-2002	23-DEC-2002	
Date analysed		23-DEC-2002	23-DEC-2002	23-DEC-2002	23-DEC-2002	

Signed:

Danny Slee, Environmental Residues - NSW

Date: 13-JAN-2003

AGAL

REPORT OF ANALYSIS

Client	: ENVIRONMENTAL & EARTH SCIENCES PO BOX 380 NORTH SYDNEY NSW 2059	**Job No.** **Quote No.** **Order No.** **Date Sampled** **Date Received**	: ENVI10/021219 : QT-00500 : : : 19-DEC-2002
Attention	: HUGH MCCAFFERY	**Sampled By**	: CLIENT
Project Name	:		
Your Client Services Manager	: BRIAN WOODWARD	**Phone**	: (02) 94490151

Lab Reg No.	Sample Ref	Sample Description
N02/042046	SS52	SOIL PALMERS ISLAND JOB 50212
N02/042047	BH53	SOIL PALMERS ISLAND JOB 50212 (0-0.1M)
N02/042048	SS54	SOIL PALMERS ISLAND JOB 50212
N02/042049	DUP1	SOIL PALMERS ISLAND JOB 50212

Lab Reg No. Sample Reference	Units	N02/042046 SS52	N02/042047 BH53	N02/042048 SS54	N02/042049 DUP1	Method
Trace Elements						
Total Solids	%	82.3	87.5	85.3	82.6	NT2_49

Signed:

Dr. Honway Louie, Trace Elements - NSW

Date: 13-JAN-2003

Lab Reg No. Sample Reference	Units	N02/042046 SS52	N02/042047 BH53	N02/042048 SS54	N02/042049 DUP1	Method
Organochlorine (OC) Pesticides						
HCB	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
gamma BHC (Lindane)	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
Heptachlor	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
Aldrin	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
BHC(other than g-BHC)	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
Heptachlor epoxide	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
Chlordane (trans and cis)	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
DDE	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
Dieldrin	mg/kg	0.013	<0.010	<0.010	<0.010	NR_19
Endrin	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
DDD	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
DDT	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
Methoxychlor	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
Total Endosulfan	mg/kg	<0.010	<0.010	<0.010	<0.010	NR_19
Surrogate						
Surrogate OC Rec.	%	102	98	95	98	NR_19
Dates						
Date extracted		23-DEC-2002	23-DEC-2002	23-DEC-2002	23-DEC-2002	

AGAL

REPORT OF ANALYSIS

Lab Reg No.	Units	N02/042046	N02/042047	N02/042048	N02/042049	Method
Sample Reference		SS52	BH53	SS54	DUP1	
Dates						
Date analysed		23-DEC-2002	23-DEC-2002	23-DEC-2002	23-DEC-2002	

Signed:

Danny Slee, Environmental Residues - NSW

Date: 13-JAN-2003

All results are expressed on a dry weight basis. TE Ref. SM377-02.8.

This Laboratory is accredited by the National Association of Testing Authorities, Australia. [Accreditation No 198].
The tests reported herein have been performed in accordance with its terms of accreditation.

Sample/s analysed as received.
This Report supersedes reports: *RN333158* *RN334547*
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AGAL

REPORT OF ANALYSIS

Report No. RN334804

Client	: ENVIRONMENTAL & EARTH SCIENCES PO BOX 380 NORTH SYDNEY NSW 2059	**Job No.** **Quote No.** **Order No.** **Date Sampled** **Date Received**	: ENVI10/021219 : QT-00500 : : : 19-DEC-2002
Attention	: HUGH MCCAFFERY	**Sampled By**	: CLIENT
Project Name	:		
Your Client Services Manager	: BRIAN WOODWARD	**Phone**	: (02) 94490151

Lab Reg No.	Sample Ref	Sample Description
N02/042050	SS16	SOIL PALMERS ISLAND JOB 50212

Lab Reg No.		N02/042050				
Sample Reference	Units	SS16				Method
Trace Elements						
Total Solids	%	90.9				NT2_49

Signed:

Dr. Honway Louie, Trace Elements - NSW

Date: 13-JAN-2003

Lab Reg No.		N02/042050				
Sample Reference	Units	SS16				Method
Total Petroleum Hydrocarbons						
TPH C6 - C9	mg/kg	<25				NGCMS_1121
TPH C10 - C14	mg/kg	<50				NGCMS_1112
TPH C15 - C28	mg/kg	<100				NGCMS_1112
TPH C29 - C36	mg/kg	<100				NGCMS_1112
Surrogate						
Surrogate 1 Rec.	%	98				
Surrogate 2 Rec.	%	98				
Dates						
Date extracted		20-DEC-2002				
Date analysed		20-DEC-2002				

Signed:

Danny Slee, Environmental Residues - NSW

Date: 13-JAN-2003

AGAL

REPORT OF ANALYSIS

All results are expressed on a dry weight basis. TE Ref. SM377-02.8.

This Laboratory is accredited by the National Association of Testing Authorities, Australia.
[Accreditation No 198].
The tests reported herein have been performed in accordance with its terms of accreditation.

Sample/s analysed as received.
This Report supersedes reports: *RN332535* *RN333158* *RN334653*

AGAL

QUALITY ASSURANCE REPORT

Client: Environmental & Earth Sciences **AGAL Job No: ENVI10/021219**

Sample Matrix: Soil **Job No: 50212**

Analyte	LOR	Blank	Sample Duplicates			Sample Spikes		
			Sample	Duplicate	RPD	Spike 1	Spike 2	RPD
	mg/kg	mg/kg	mg/kg	mg/kg	%	%	%	%
BTEX			**N02/042147**			**Blank Soil**		
Benzene	0.5	<0.5	<0.5	<0.5	-	103	98	4.9
Toluene	0.5	<0.5	<0.5	<0.5	-	103	101	2.3
Ethylbenzene	0.5	<0.5	<0.5	<0.5	-	98	95	2.6
Xylene	1.0	<1.0	2.9	3.0	3.4	99	97	2.5
TPH			**N02/042147**			**Blank Soil**		
TPH C6-C9	25	<25	<25	<25	-	101	98	3.1
			N02/042148			**Blank Soil**		
TPH C10-C14	50	<50	<50	<50	-	105	104	1.5
TPH C15-C28	100	<100	<100	<100	-	101	102	1.3
TPH C29-C36	100	<100	<100	<100	-	-	-	-
Surrogate 1 Recovery	-	-	101	103	2.0	101	104	2.9
Surrogate 2 Recovery	-	-	100	102	2.0	101	102	0.99

Results expressed in percentage (%) or mg/kg wherever appropriate on dry weight basis.
'-' = Not Applicable.
Method used : AGAL Method NGC/MS 11.12 and 11.21
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Acceptable Spike recovery is 70-130% (For BTEX and TPH C6-C9)
Acceptable Spike recovery is 50-150% (For TPH C10-C36)
Acceptable RPDs on spikes and duplicates is 40%.
RPD= Relative Percentage Difference.

Signed:

Danny Slee, Senior Chemist
Environmental GCMS
Date: 9/01/03

AUSTRALIAN GOVERNMENT ANALYTICAL LABORATORIES
ABN 51 835 430 479 002
1 Suakin Street, Pymble NSW 2073 PO Box 385 Pymble NSW 2073
Tel: +61 2 9449 0111 Fax: +61 2 9449 1653 www.agal.gov.au

ITEM 13.249/13 - 19
Part 2

ENVI10/021219
Due: 10/1/03

CHAIN OF CUSTODY - ORGANIC ANALYSIS REQUEST FORM

Sheet 1 of 2

Job No: 50212 Site Location: Palmers Island 1.4 Sampler: HUGH MCAFFERY

Date: 18.12.02 Lab: ACAL Report To: HUGH MCAFFERY

SAMPLE ID	ANTICIPATED RESULTS / EC RESULT	FID	pH	Sample Description: SOIL	WATER	SEDIMENT	Analysis Required - Barcodes: TPH	BTEX	PAH	OCP	EXTENDED 8270 SCAN	Barcode					Method: GC	GCMS	INFRARED
CS1				✓						✓		N02/042034							
CS3				✓						✓		N02/042035							
CS8				✓						✓		N02/042036							
CS9				✓						✓		N02/042037							
CS11				✓						✓		N02/042038							
CS13				✓						✓		N02/042039							
CS14				✓						✓		N02/042040							
CS16				✓						✓		N02/042041							
CS21				✓						✓		N02/042042							
CS23				✓						✓		N02/042043							
CS25				✓						✓		N02/042044							
SS51				✓						✓		N02/042045							
SS52				✓						✓		N02/042046			TE	✓			
BH53 0-0.1m				✓						✓		N02/042047			DE	½	16.		
SS54				✓						✓		N02/042048							
DUP1				✓						✓		N02/042049							
SS16				✓			✓					N02/042050				✓			
TS-TDT-SOIL																			
TOTAL				17			1			16									

RECEIVED
10 DEC
11:30

TURN AROUND: (NORMAL) / 3 DAYS / 48 HRS / 24 HRS

COMMENTS: Could you please composite samples supplied in bags as per bag number and list attached to COC. These samples were taken from a sugar cane plantation. Could you please hold onto discrete samples after compositing.

	Time	Date
Left E&ES Site:	1.00pm	18.8.02
Transported By:	TNT	18.8.02
Received Lab:		
Fax Results Rec'd:		
Typed Results Rec'd:		

LAB SUPERVISOR:

Environmental & Earth Sciences
ph: (02) 9922 1777 fax: (02) 9922 1010

SYDNEY ANALYTICAL LABORATORIES

CHECKED

Office:
PO BOX 48
ERMINGTON NSW 2115

Laboratory:
1/4 ABBOTT ROAD
SEVEN HILLS NSW 2147
Telephone: (02) 9838 8903
Fax: (02) 9838 8919
A.C.N. 003 614 695
A.B.N. 81 829 182 852

ANALYTICAL REPORT for:

ENVIRONMENTAL & EARTH SCIENCES

PO BOX 380
NORTH SYDNEY 2059

ATTN: HUGH McCAFFERY

JOB NO:	SAL12814
CLIENT ORDER:	50212
DATE RECEIVED:	19/12/02
DATE COMPLETED:	08/01/03
TYPE OF SAMPLES:	SOILS
NO OF SAMPLES:	13

NATA Accredited Laboratory
Number: 1884

NATA ENDORSED TEST REPORT
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.....
Issued on 15/01/03
Lance Smith
(Chief Chemist)

SYDNEY ANALYTICAL LABORATORIES

ANALYTICAL REPORT

JOB NO: SAL12814
CLIENT ORDER: 50212

	SAMPLES	Cu mg/kg	Pb mg/kg	Zn mg/kg	Cd mg/kg	Cr mg/kg	Ni mg/kg
1	CS2	17	17	57			
2	CS4	15	18	56			
3	CS5	20	27	67	<0.5	15	6.0
4	CS6	15	19	54			
5	CS10	15	20	56			
6	CS12	16	18	53			
7	CS15	15	20	59	<0.5	16	10
8	CS18	15	20	59			
9	CS19	15	21	58			
10	CS24	17	22	74			
11	CS20	14	17	52	<0.5	15	8.0
12	SS67	10	19	51			
13	DUP/2	11	21	52			
	BCSS-1	18	21	115	<0.5	85	52
MDL		0.5	0.5	0.5	0.5	0.5	0.5
Method Code		M1	M1	M1	M1	M1	M1
Preparation		P3	P3	P3	P3	P3	P3

SYDNEY ANALYTICAL LABORATORIES

ANALYTICAL REPORT

JOB NO: SAL12814
CLIENT ORDER: 50212

	SAMPLES	As mg/kg	Hg mg/kg
3	CS5	5.0	0.090
7	CS15	5.5	0.12
11	CS20	5.0	0.12
	BCSS-1	11	0.14
MDL		0.5	0.005
Method Code		M7	M3
Preparation		P3	P1

RESULTS ON DRY BASIS

SYDNEY ANALYTICAL LABORATORIES

CERTIFIED REFERENCE MATERIAL

JOB NO: SAL12814
CLIENT ORDER: 50212

CRM Number	Analyte	Units	CRM Result	Certified Value	%Recovery	Acceptance Criteria %
BCSS-1	Copper	mg/kg	18	18.5	97	90-115
BCSS-1	Lead	mg/kg	21	22.7	93	90-110
BCSS-1	Zinc	mg/kg	115	119	97	90-110
BCSS-1	Cadmium	mg/kg	<0.5	0.25	-	-
BCSS-1	Chromium	mg/kg	85	123	69	60-80
BCSS-1	Nickel	mg/kg	52	55.3	94	90-110
BCSS-1	Arsenic	mg/kg	11	11.1	99	90-120
BCSS-1	Mercury	mg/kg	0.14	0.129	109	85-110

All results are within the acceptance criteria

Note: The hot acid digest does not always determine 'total' metals. Refractory elements such as Iron and Aluminium and some base metals (particularly Chromium) show lower recoveries depending on their form within the sample matrix. Silicates and oxides are normally less soluble than elements in metallic or salt forms. The acceptance criteria for this reference material is based on histories of analyte recoveries using the nitric acid based digestion procedures.

SYDNEY ANALYTICAL LABORATORIES

ANALYTICAL REPORT

JOB NO: SAL12814
CLIENT ORDER: 50212

METHODS OF PREPARATION AND ANALYSIS

The tests contained in this report have been carried out on the samples as received by the laboratory.

P3	Sample dried, jaw crushed and sieved at 2mm
P1	Analysis performed on sample as received
M1	Base Metal - Digestion Method 3050 (HNO_3/H_2O_2) Element determined by APHA 3111B (Flame AAS)
M7	Hydride Element - Digestion Method 7061 (HNO_3/H_2SO_4) Element determined by APHA 3114B (Hydride Generation AAS)
M3	Mercury - Digestion Method 7471 (HNO_3/HCl) Determined by APHA 3112B (Cold Vapour AAS)

A preliminary report was faxed on 08/01/03

ITEM 13.249/13 - 25
Part 2
Sheet ___ of ___

CHAIN OF CUSTODY - INORGANIC ANALYSIS REQUEST FORM

Job No: 50212 Site Location: Palmers Island, NSW Sampler: HUGH MCAFFERY

Date: 17·12·02 Lab: SAL Report To: HUGH MCAFFERY

SAMPLE ID	pH	Sample Description: SOIL	WATER	SEDIMENT	Analysis Required: HEAVY METALS	IONIC BALANCE	PHENOLS	CEC AND EXCHANGEABLES	LEACH PROCEDURE	CYANIDE TOTAL/FREE	Cu, Pb, Zn					ANTICIPATED RESULTS/ TURNAROUND TIME
CS2		✓									✓					
CS4		✓									✓					
CS5		✓			✓											
CS6		✓									✓					
CS10		✓									✓					
CS12		✓									✓					
CS15		✓			✓											
CS18		✓									✓					
CS19		✓									✓					
CS24		✓									✓					
CS20		✓			✓											
SS67		✓									✓					
DUP 2		✓									✓					
TOTAL		13			3						10					

TURN AROUND: (NORMAL) / 3 DAYS / 48 HRS / 24 HRS

COMMENTS: Could you please composite samples supplied in bags as per number and list attached to COC. These samples were taken from a sugar cane plantation. Please hold discrete samples after compositing.

	Time	Date
Left E&ES Site:	1·00pm	18·8·02
Transported By:	TNT	18·8·02
Received Lab:	P. Magno (SAL)	19/12/02
Fax Results Rec'd		
Typed Results Rec'd		

LAB SUPERVISOR:

Environmental & Earth Sciences
ph: (02) 9922 1777 fax: (02) 9922 1010

APPENDIX D

PROCEDURES FOR QUALITY CONTROL AND QUALITY ASSURANCE

TABLE OF CONTENTS

1.0 INTRODUCTION

The terms "quality assurance" and "quality control" are often confused. With respect to laboratory analysis activities, these terms are defined in these guidelines as follows:

Quality Assurance (QA): "All the planned and systematic activities implemented within the quality system and demonstrated as needed to provide adequate confidence that an entity will fulfil requirements for quality". (ISO 8402-19941)

This encompasses all actions, procedures, checks and decisions undertaken to ensure the accuracy and reliability of analysis results. It includes routine procedures which ensure proper sample control, data transfer, instrument calibration, the decisions required to select and properly train staff, select equipment and analytical methods, and the day-to day judgements resulting from regular scrutiny and maintenance of the laboratory system.

Quality Control (QC): "The operational techniques and activities that are used to fulfil the requirements for quality". (ISO 8402-1994)

These are the components of QA which serve to monitor and measure the effectiveness of other QA procedures by comparison with previously decided objectives. They include measurement of the quality of reagents, cleanliness of apparatus, accuracy and precision of methods and instrumentation, and reliability of all of these factors as implemented in a given laboratory from day to day.

A complete discussion of either of these terms or the steps for implementing them is beyond the scope of this manual. It is widely recognised, however, that adoption of sound laboratory QA and QC procedures is essential and readers are referred to documentation available from the National Association of Testing Authorities (NATA), if further information is required.

The aim of a quality control and assurance program is to deliver data that is representative of what is sampled, precise, accurate and reproducible. In any program, quality control is required before assurance can be put in place. As investigations involve both field and laboratory analysis the QC/QA program is similarly divided. Field quality assurance is used not only to ensure precision, accuracy and reproducibility but that the sample is representative of the site conditions.

The objective of this document is to evaluate and identify quality data, which meets or exceeds Environmental & Earth Sciences Pty Ltd specifications and to ensure that sample

data is of the highest calibre. Data assessment for laboratories involved the comparison of laboratory QC/QA results to that of documented US EPA (1994) SW-846 methods (reference 1), US EPA CLP (1994) *National Functional Guidelines for Inorganic Data Review* (reference 8) and US EPA CLP *National Functional Guidelines for Organic Data Review* (reference 9), and other internationally recognised publications. Reference to Australian "in-house" laboratory methods, as well as specific company methods, may be applied. These are revisable through laboratory NATA assessments. All laboratory sample and QC/QA data for this project have been issued as final and have been checked by the following NATA Registered Laboratories, unless otherwise stated:

Project Laboratory (Inorganics): Sydney Analytical Laboratories, NATA Registration No. 1884 (Sydney); and

Project Laboratory (Organics): Australian Government Analytical Laboratories, NATA Registration No. 198 (Sydney).

This document provides a brief discussion on methods undertaken to collect and analyse samples, sample and document conveyance and quality assurance testing.

2.0 FIELD PROCEDURES FOR SAMPLING AND CONVEYANCE

2.1 Introduction

All soil, surface water, groundwater, and borewater sampling procedures to be followed are described in full in Environmental & Earth Sciences Pty Ltd *Soil, gas and groundwater sampling manual* (reference 6). The full copy is available for inspection if required. Some aspects, relevant to the investigations, are discussed below.

Other information is reported in Keith, 1991 (reference 3).

2.2 Sampling

2.2.1 General

The following standard procedures are employed during sampling of soil, soil gas and groundwater:

1. all sampling equipment is cleaned prior to the commencement of sampling;
2. sampling equipment is cleaned after each use or as required;
3. work in sites perceived to be 'cleaner' is undertaken first, where practical; and
4. only the minimum number of personnel necessary to achieve objectives are allowed within 10 metres of the sampling activity.

Gas chromatography and organic vapour analysis (OVA) can be employed to locate preferred sampling sites and will be employed to aid in selection of samples for laboratory analysis.

The procedures summarised below generally apply to most sites, however, variations may occur due to local conditions.

2.2.2 Soil sampling

Sample preservation and storage requirements depend on the parameters to be analysed.

Sample storage recommendations vary among authors, so the most commonly recommended containers for sampling for inorganic parameters and indicators are plastic, glass or teflon containers. Due to the possibility of leaching of metals from glass, Environmental & Earth Sciences Pty Ltd use plastic containers for metal analyses and glass containers for organic indicators such as TOC and oil and grease because of the increased adsorption of organics to plastics.

New sample bottles were used for every sample.

2.2.3 Groundwater sampling

Environmental & Earth Sciences Pty Ltd uses a submersible electric centrifugal pump for purging and groundwater sampling in > 40 mm diameter piezometers. This allows for a continuous water supply to the sample container. The pump is 38 mm in diameter and coated with an acetal co-polymer. It is driven by a 12 volt D.C. supply and is capable of pumping up to 10 L/min. A single pump is able to lift 8 m of water head and can be linked in series with other pumps for greater depths. Clear vinyl tubing (CVT) is connected between the pumps and is easily replaced to prevent cross contamination.

Amber glass bottles are used for samples being submitted for organic analysis while plastic bottles are used for samples being submitted for inorganic analysis. Samples to be submitted for cyanide analysis are preserved with sodium hydroxide to raise pH to between 10 and 11.

Bores are sampled using the following protocol:

1. The standing water level and the depth of each bore prior to purging is measured;
2. The submersible pump is then connected to the 12 volt supply and lowered beneath the water level;
3. Water is then pumped through the pumping arrangement before being placed into a container which houses the portable meters. During field sampling, pH, Eh (redox), electrolytic conductivity (EC), odour, clarity and recharge are measured and noted. A water sample is only taken after the pH, EC and pe of the water has stabilised or the water supply is running low.
4. The polyethylene container and cap are rinsed with groundwater taken from the bore. The vinyl hosing connected from the pump is then placed at the bottom of the sampling bottle;
5. If the water supply allows, the bottle is filled to overflowing one to two times the volume of the container. To minimise oxidation, all the trapped air is expelled completely from the sample bottle which is capped immediately after filling;
6. The bottles are then labelled with the appropriate information:
   - project name and number;
   - signature or initial of sample collector;
   - date of sample collection;
   - location.

Filtering is not carried out in the field because of the low volumes of water in the bores and slow yields. All samples are stored in an Esky with ice (below 4°C) and where possible taken to AGAL and SAL on the same day of sampling (which is usually less than 6 hours from taking the first sample). Preserving the samples without filtering is not undertaken as the addition of acid would result in stripping metals and ions from the suspended sediments which can cause erroneous results;

7. Between each sampling the pumps are cleaned either with water or rinsed with the proceeding bores groundwater; and
8. After the samples have been taken to AGAL and SAL they are filtered (<0.45µm) or centrifuged and prepared for analysis at the laboratory on the same day of sampling.

2.3 Sample labelling

In the field, each sample container will be clearly labelled with a waterproof marker. All or some of the following details will be recorded on each label:

1. project name and number;
2. hole number;
3. sample depth (for a soil sample);
4. date of sample collection;
5. signature or initial of sample collector; and
6. preservation treatment.

2.4 Equipment decontamination

All sampling equipment, and any items which come into contact with groundwater or soil samples, will be thoroughly washed with water, then rinsed with clean water and dried before the collection of each sample. This may be varied depending on the site conditions. Any items accidentally contaminated will be similarly washed before re-use. Should equipment become contaminated with oily wastes, acetone washing should be used if the decontamination detergents are unsuccessful in removing all organic residues.

Due care will be taken with the disposal of any wash water and residues from such cleaning operations. A sample of wash water will be kept and stored. If necessary, decontaminated wash water samples may be analysed to detect any cross contamination. Cleaning of equipment is addressed in the sampling manual.

2.5 Sample packing and transport

2.5.1 Chain of custody record

At the end of each days sampling the field manager in association with the project manager will select samples for laboratory testing based on the field observations and measurements, history and other data and specify the tests to be undertaken on each sample. Samples required for QC/QA will also be selected at this time.

Once selection has been made, the anticipated result range will be recorded (Organics: clear, trace, low, medium or high; Inorganics: trace, low, medium or high).

Before packing and dispatch of samples for analysis, a chain of custody form will be completed. This form will record details of the individual samples being dispatched and the details of analysis required for each individual sample, as well as relevant data for the laboratory.

A copy of the completed chain of custody record will be retained in the field job file and the original sent with the samples for analysis. A copy will be faxed or delivered to the offices of Environmental & Earth Sciences Pty Ltd together with the days geological logs and log of the days site activities including contractors work time. These will be placed in the job file in the office.

2.5.2 Packing

The refrigerated samples will be packed upright in an Esky with each jar or bottle, or plastic bag sealed in a larger bag containing all the samples from one hole. The original chain of custody form will be enclosed in each Esky that will be sealed, labelled and addressed to the analytical laboratory.

2.5.3 Transport

In general, the field scientists who collect the samples, whenever possible, packs the samples for delivery to the laboratory.

When the field scientist is unable to deliver the samples to the laboratory, arrangements will be made for a courier to dispatch samples to the analytical laboratories as soon as possible after packing, usually within 24 hours of the samples being taken.

Upon receipt of the samples the analytical laboratory will cross check the samples against the chain of custody form and report any discrepancies.

3.0 SAMPLE PREPARATION AND STORAGE

3.1 Selected laboratories

The laboratories selected to provide analytical services for this project were:

7. for inorganic analysis, Sydney Analytical Laboratories; and
8. for organic analysis, Australian Government Analytical Laboratories.

Both laboratories are located in Sydney.

Environmental & Earth Sciences Pty Ltd selected these laboratories on the following criteria:

1. inspection of the laboratories and a good working relationship with the chemists performing the tests resulting from at least 10 years association;
2. qualifications and experience of laboratory staff;
3. NATA registration for routine test methods and commonly encountered sample matrices,
4. satisfactory compliance to Environmental & Earth Sciences Pty Ltd quality objectives and response to out of specification or otherwise variable samples;
5. customer service assurances that all reports are to be issued within agreed time frames;
6. these laboratories certify that the results can be relied upon to be precise, accurate and reproducible; and
7. these laboratories carry all appropriate insurance.

Environmental & Earth Sciences Pty Ltd close association with the laboratories means that very rapid turnaround times can be achieved, if required.

Sydney Analytical Laboratories (SAL) and Australian Government Analytical Laboratory (AGAL) carry out extensive documented QA/QC procedures as set out in US EPA SW-846 "Test Methods for Evaluating Solid Waste" (June 1990) and APHA "Standard Methods for the Examination of Water and Waste-water" (19th Edition) Section 1020/1030. Both standards set out definitions of bias, lower limits of detection (LLD), precision, accuracy, completeness and comparability; along with correct procedures for standard / reagent preparations, instrument calibrations, data reduction validation and reporting, and corrective actions where required. The laboratory's QA/QC program have been fully approved by the National Association of Testing Authorities (NATA), and the list of analyses for which SAL and AGAL are accredited can be supplied on request.

The laboratories participate in frequent proficiency testing programs, which monitor inter-laboratory performance. Organisations running these round robins include NATA, FPA,

Water Board and ASPAC. Results of all programs are inspected during NATA laboratory audits, held every two years.

One facet of particular interest in the quality system is the nature and frequency of internal check standards and samples. These provide batch to batch monitoring of analytical data for precision and accuracy, enabling immediate corrective actions to be undertaken should any discrepancies come to light.

Any result that is considered by the chief chemist to be unusually high or above regulatory limits is automatically re-analysed. A significantly different result requires immediate remedial action on the whole sample batch (retesting or using an alternative analytical method).

3.2 Sample preparation

To obtain reproducible results it is essential that laboratories use standardised procedures for the preparation of samples. These procedures will not necessarily be the same for each sample but will comprise various combinations of the following treatments:

— separation and removal of extraneous components;
— homogenising;
— drying;
— grinding;
— sieving; and
— partitioning (to obtain representative portions).

The combination of treatments applied to any sample will depend primarily on the nature of the analytes of interest. These can be split into three broad categories:

— non-volatile compounds (including most metals, inorganics and some heavy organics);
— semi-volatiles compounds (many organics, some metals and other inorganics subject to evaporative losses); and
— volatile compounds (such as organic solvents and inorganic gases).

The laboratories address the problems associated with these steps in their own sampling manuals.

3.3 Sample storage

To maintain sample integrity, it is necessary that it is collected and kept in a container that will not add to or reduce the analyte concentration in the sample. It is also important to note that the less time the sample is stored, the more accurate the analytical result is likely to be. Table 1 lists the containers, maximum holding time and condition of the soil for the analytes included in these guidelines.

Storing of field moist samples has the disadvantage that it will allow faster degradation of analytes via microbial activity, particularly if samples are stored at ambient temperatures. Moist samples should therefore be stored at low temperature (4°C or below) and the analysis carried out within a reasonable time.

TABLE 1

CONTAINERS, HOLDING TIME AND CONDITION OF SOIL

Analyte	Method No.	Container[1]	Maximum holding time [4]	Sample condition
Leachable metals and semi-volatile organics	101	As for analyte of interest	As for analyte of interest	As for analyte of interest
Moisture content only	102	P or G	7 days	Field-moist
Moisture correction	102	As for analyte of interest	Same day as sample extraction for analyte	Field-moist
pH	103	P or G	7 days	Air-dry
Electrical conductivity	104	P or G	7 days	Air-dry
Organic carbon	105	G[2]	7 days	Air-dry
Metals (except mercury)	201, 202, 203	P (AW)	6 months	Field-moist or air-dry
Mercury	204	P (AW)[3]	28 days	Field-moist
Cation exchange capacity and exchangeable cations	301	P (AW)	6 months	Air-dry
Chloride (water soluble)	401	P or G	7 days	Field-moist or air-dry
Bromide (water-soluble)	402	P or G	7 days	Air-dry
Cyanide	403	P or G[2]	7 days	Field-moist
Fluoride	404	P	7 days	Field-moist or air-dry
Sulfur-total and Sulfate	405 and 406	P or G	7 days	Field-moist or air-dry
Sulfide	407	P or G[3]	7 days	Field-moist
Volatile organics: MAH, Halogenated HC and Miscellaneous	501.1, 501.2 and 501.3	G (SR)[2]	14 days	Field-moist
Semi-volatile organics		G (SR)[2]	14 days	Field-moist
PAH	502.1, 502.2		30/14 days	
Chlorinated hydrocarbons	503		30/14 days	
OC pesticides and PCB	504			
OP Pesticides	505		30/14 days	
Petroleum hydrocarbons	506.1, 506.2		30/14 days	
Phenols, Herbicides, Phthalate esters	507, 508, 509		30/14 days	

Notes:

1. Minimum volume of 250 mL; P = Plastic; G = Glass ; AW = Acid-washed; SR = Solvent rinsed
2. Store in the dark
3. Add sufficient 2M zinc acetate to fully cover surface of solid with minimal headspace; store at 4°C
4. 30/14: Soil holding time / other media holding time

Air-dried or oven-dried samples easily absorb moisture. Immediately after grinding, homogenising and partitioning, the prepared samples should be transferred into clearly

labelled and sealed containers to be stored under dry, relatively cool (<18°C) and low light conditions while awaiting analysis.

Exceedence of the storage time does not mean that the result is not useful, but only that the analyte decay or variation may have occurred.

All portions of the sample not analysed should be retained until agreed to or advised by the client that they may be discarded, or retained for a reasonable amount of time after the dispatch of the analytical report (eg two months).

4.0 LABORATORY DATA QUALITY OBJECTIVES

4.1 Introduction

Through the QC procedures adopted, the laboratory should be able to demonstrate:
— Method proficiency within the laboratory;
— Conformance to the performance characteristics expected of the method; and
— Confidence in the results produced.

Environmental & Earth Sciences Pty Ltd adopt the QC procedures described in Chapter 1: Quality Control in "Test Methods for Evaluating Solid Waste", USEPA Publication SW-846 4 (reference 1) in all analysis.

Many of the organic analysis methods recommended in this manual are derived from USEPA SW-846, and the QC procedures referred to above form a part of those methods. These procedures or variations of them can be incorporated into almost any analytical method. When using these USEPA methods, the analyst should consider the criteria for conformance to QC/QA requirements as discussed in "Criteria for Assessing Conformance to USEPA Testing Methods".

4.2 Recommended quality control procedures

The Australian and New Zealand Environmental and Conservation Council (1996) — *Guidelines for the laboratory analysis of contaminated soils* (reference 4) expect that laboratories would incorporate the following QC procedures:

4.2.1 Analysis blank

(at least one per process batch)

The component of the analytical signal which is not derived from the sample but from reagents, glassware, etc. can be determined by processing solvents and reagents in exactly the same manner as for samples. If below the maximum acceptable method blank (established during the method validation), this contribution is subtracted from the gross analytical signal for each analysis before calculating the sample analyte concentration. SAL reports that if the method blank value is greater than twice the detection limit, corrective action is taken to ascertain the source of contamination (frequency at SAL: 1 in 20 samples (5%)).

4.2.2 Laboratory replicate analysis

(at least one per process batch or one per ten samples, whichever is the smaller)

This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected for duplicate analysis should be one where the analyte concentration is easily measurable. The variation between duplicate analyses should be recorded for each process batch to provide an estimate of the precision of the method.

In the laboratory this occurs at a rate of 1 in every 10 to 20 samples for Environmental & Earth Sciences Pty Ltd samples. Sample batches of less than five samples may not include a sample duplicate unless specifically requested.

SAL reports that for soils, the sample is riffle divided into two equal portions at the preparation stage, and the duplicates analysed concurrently. For waters, the same sample is re-analysed at a different time, and occasionally by a different operator.

Replicate data for precision is expected to be <30% RPD (<40% for AGAL) at concentration levels greater than ten times the EQL, or <50% RPD at concentration levels less than ten times the EQL. Sample results identified with an RPD exceeding 100% shall require specific discussion. Certain methods may allow for threshold limits, which lie outside the above mentioned limits.

4.2.3 Field duplicate analysis

These samples provide a check on the analytical performance of the laboratory. On larger jobs, at least 5 percent of soil samples from a site are collected in duplicate. One of the duplicate samples from each split set is submitted to a secondary laboratory and the remaining samples to the primary laboratory. For comparability of data, it is important that there is little delay in the sample submission to allow minimum time difference between commencement of analysis by both laboratories. This is particularly important with the analysis of volatile compounds.

For split samples, because of error associated with field splitting, an RPD of between 80 and 150% (depending on the substance) is allowed. Soil heterogeneity due to the "nugget effect" could result in significantly greater difference, particularly for metals. Consequently, samples with the most observable field homogeneity are endeavoured to be selected.

Blind replicate samples provide a check of the repeatability of the laboratory's analysis. At least 5 percent of samples should be taken from a larger than normal quantity of soil collected from the same sampling point, removed from the ground in a single action if possible. This should be mixed as thoroughly as practicable and divided into two vessels. These samples should be submitted to the laboratory as two individual samples without any indication to the laboratory of their common source.

A similar test of analysis repeatability is provided by re-submission of previously analysed samples, provided the stability of analyte is adequate under the storage conditions used between the two submission dates.

4.2.4 Laboratory control sample

(at least one laboratory control sample per process batch)

This comprises either a standard reference material or a control matrix fortified with analytes representative of the analyte class. Recovery check portions should be fortified at concentrations which are easily quantified but within the range of concentrations expected for real samples.

Recovery data for any LCS is described by control limits specified by AGAL and SAL used and referenced to US EPA SW-846 guideline values (reference 1).

AGAL occasionally use their own SRMs prepared by their research department.

4.2.5 Matrix spikes

(one matrix spike for each soil type)

The purpose of the matrix spike is to monitor the performance of the analytical methods used, and to determine whether matrix interferences exist. When the recovery of the matrix spike is below the expected analytical method performance, it may be necessary to use other internal calibration methods, a modification of the analytical method or alternative analytical methods to accurately measure the analyte concentration in the extract.

In most cases, matrix spikes should be added at a concentration equivalent to the corresponding regulatory level. The spiking concentrations should be reported. If the analyte concentration is less than one half the regulatory level, the spike concentration may be as low as one half of the analyte concentration, but may be not less than five times the method detection limit. In order to avoid differences in matrix effects, the matrix spikes must be added to the same nominal volume of sample as that which was analysed for the un-spiked sample.

Matrix spikes are reported as a %R, one in every 20 samples for all Environmental & Earth Sciences Pty Ltd samples.

Recovery data for any matrix spikes is described by control limits specified by AGAL and SAL and referenced to US EPA SW-846 method guideline values.

SAL reports that to complement the use of certified referenced materials in soil work, water samples can be spiked with known concentrations of each analyte to assess analyte recovery and possible matrix interferences. This technique is most useful for metals testing, although it can also be applied to general chemistry parameters. The percent recovery should generally lie between 80-120% for most elements. This is usually undertaken only at our request.

For AGAL, the acceptable spike recovery range is as follows:

TABLE 2

AGAL – ACCEPTABLE SPIKE RECOVERY RANGE

Test	Acceptable spike recovery range
PAH / Phenols / 8270	50 – 150 %
TPH $C_{10} - C_{36}$	50 – 150 %
TPH $C_6 - C_9$ / BTEX	70 – 130 %

The list of the spiking mixes of AGAL is available upon request, but the concentration of the spikes should be stated in the report.

4.2.6 Surrogate spikes

(where appropriate)

For determinations where it is appropriate eg. chromatographic analysis of organics, surrogate spikes should be added to all analyses. Surrogate spikes are known additions to each sample, blank and matrix spike or reference sample analysis, of compounds which are similar to the analytes of interest in terms of:

1. extraction;
2. recovery through clean-up procedures; and
3. response to chromatography or other determination.

but which:

4. are not expected to be found in real samples;
5. will not interfere with quantification of any analyte of interest; and
6. may be separately and independently quantified by virtue of, for example, chromatographic separation or production of different mass ions in a GCIMS system.

Surrogate spikes are added to the analysis portion before extraction. The purpose of surrogates is to provide a means of checking, for one analysis, that no gross errors have occurred at any stage of the procedure leading to significant analyte losses.

In the case of organic analyses the surrogate spike compounds may be deuterated, alkylated or halogenated analogues, or structural isomers of analyte compounds.

Recovery data for accuracy is described by control limits specified by AGAL and SAL and referenced to US EPA SW-846 method guideline values. Surrogate compounds and their concentration should be specified. In the event that a surrogate recovery fails to comply with acceptable control limits, the following remedies shall proceed:

— the laboratory will be requested to review data;
— no further action necessary if all surrogate recoveries greater than the minimum specified %R and all sample concentration results reported are less than the EQL; and
— professional expertise is required where surrogate recoveries are reported below the acceptable control limits, which then may require additional analysis or retesting.

4.2.7 Internal standards

(where appropriate)

Use of internal standards is highly recommended for chromatographic analysis of organics. Internal standards are added, after all extraction, clean-up and concentration steps, to each final extract solution. The addition is a constant amount of one or more compounds with similar qualities as detailed in section 4.2.6 points 4, 5 and 6 above.

The purpose of internal standards is to check the consistency of the analytical step (eg. injection volumes, instrument sensitivity and retention times for chromatographic systems) and provide a reference against which results may be adjusted in case of variation (for organics analysis only).

Injection volume and instrument sensitivity variations are usually adjusted for by calibration using the ratio of peak height or area for analytes compared with that for the internal standards).

Note that the chromatograms for final extracts may then contain both internal and surrogate standards. The compounds used for these standards may be similar but the different stage of analysis at which they are added allows them to provide different information.

4.3 Method validation

4.3.1 Definition

This is the process of obtaining data on a method in order to determine its characteristic performance and to establish confidence in the use of the method to obtain reliable results. Method validation specific to each laboratory's operations needs to be performed before the method can be adopted and applied to the analysis of actual samples. The minimum validation data required are:

— accuracy;
— precision;
— percent recovery; and
— limits of detection and reporting.

4.3.2 Accuracy

Accuracy is a measure of the closeness of the analytical result obtained by a method to the "true" value. The following levels of accuracy should generally be achievable from a screening or reference method:

— screening method: within ± 40 % of:
  — the expected value of a certified reference material of similar matrix; or
  — the value obtained by a separately validated and recognised quantitative method for the sample matrix.
— reference method: within ± 15 % of:
  — the expected value of a certified reference material of similar matrix; or
  — the value obtained by a separately validated and recognised quantitative method for the sample matrix.

It is recognised, however, that coefficients of variation for a procedure can be expected to be higher for low concentrations of analytes, eg. those below ten times the minimum detectable concentration.

4.3.3 Precision

4.3.3.1 Definition

Precision is a measure of the variation in the method's results. It is a combination of two components, repeatability and reproducibility.

4.3.3.2 Repeatability

This is the precision that measures the variation in the method's results produced by the same analyst under conditions which are as close as possible using the same equipment in the one laboratory and within a short interval of time. Repeatability is expressed as a standard deviation. The smaller the standard deviation the better the repeatability. Determine the standard deviation as follows:
Perform at least 5 replicate analysis of each sample type expected to be analysed routinely. This should be repeated over at least three different analyte concentrations, across the range normally expected. From these results, calculate the standard deviation, s, for each concentration, c, as follows:

$$s_c = [\ \Sigma\ (X_i - X)^2 / (n - 1)]^{1/2}$$

where:
X_i = concentration of analyte of *i*th replicate
X = mean concentration of n replicate analytes
n = number of replicate analyses for that concentration

The acceptable repeatability of an analyte determination is, in general, two standard deviations of the mean value. This is not undertaken on each job, but undertaken quarterly for each analyte by the laboratory and reported to Environmental & earth Sciences Pty Ltd.

4.3.3.3 Confidence limit and confidence interval

When the results are assigned to the $\pm\ s_c$ multiples, they are the confidence limits eg. 10±4 mg/kg indicates the confidence limits are 6 and 14, while values from 6 to 14 represent the confidence interval. With the exception of research work, confidence limits are not reported.

4.3.3.4 Reproducibility

This is the precision that measures the variation in the method's results produced by different analysts in different laboratories under different conditions and using different equipment. It measures the 'ruggedness' of the method. Reproducibility data are best obtained through inter-laboratory comparisons and proficiency studies. Reproducibility is also expressed as a standard deviation.

4.3.4 Percent recovery

Percent recovery describes the capability of the method to recover a known amount of analyte added to a sample. This is the most realistic and useful term to be applied to the daily quality control of the analytical performance. The sample is spiked with a known quantity of the analyte such that the combined added and suspected natural concentration of the analyte is within the working range of the method. The longer the residence time of the spiked analyte before extraction or digestion, the closer is the simulation in recovering the analyte from the natural sample. The percent recovery is calculated as follows.

$$\% \text{ Recovery} = 100 (c - a) / b$$

where:
a = natural concentration of analyte determined in the sample;
b = concentration of analyte added to the sample; and
c = concentration of analyte determined in the spiked sample.

Note that if a is known beforehand, c should be approximately twice a, or b should be approximately equal to a.

The data quality objectives for recovery are between 70 and 100%. Lower recoveries may be expected for low concentrations of analytes, or an unusual matrix.

4.3.5 Limits of detection and reporting

4.3.5.1 Limit of detection (LD)

This is the concentration of analyte which, when the sample is processed through the complete method, produces a response with a 95% probability that it is different from the blank.

4.3.5.2 Limit of reporting (LR)

The limit of reporting (LR), also known as the limit of quantitation, "is the lowest concentration of an analyte that can be determined with acceptable precision (repeatability) and accuracy under the stated conditions of the test". The limit of reporting is usually calculated as follows:

LR = 10 x LD

5.0 ANALYTICAL PROCEDURES

5.1 Laboratory methods

All samples submitted for analysis for this project were analysed by one or more of the following listed laboratory methods. The laboratory test methods were NATA registered at the time of analysis.

Moisture: 5-10 g soil heated to 105°C for a minimum of 6 hours (SAL, reference US EPA 3550);

Extraction for organic compounds in soil: 10 g of sample (volatiles 8 g) extracted ultrasonically with methylene chloride for 30 minutes. Analysis undertaken using GC/MS for environmental samples (AGAL, reference based upon US EPA 625 and 625S);

Volatile TPH C_6-C_9: 5 mL extractant or water samples introduced by direct purging and analysed by capillary column Purge & Trap GC/FID (AGAL internal method NGCMS_1121, reference US EPA 5035 and 8015A);

Semi-volatile TPH C_{10}-C_{36}: extraction as above followed by analysis by GC/MS. The TPH and BTEX analysis is carried out in full scan mode. Any of the pollutants extracted and described in US EPA Method 625 can also be analysed, including PAHs, albeit at a lower sensitivity (typically 1 mg/mL for soil). This type of analysis can detect and identify many thousands of compounds with the capability for long term storage of the data for re-analysis should later questions arise as to the presence of a particular pollutant. (AGAL internal NGCMS_1112, reference US EPA 625);

BTEX: 5 mL of extractant or water samples introduced by direct purging and analysed. Analysis by capillary column purge and trap GC/FID, confirmation by secondary column technique (AGAL internal method NGCMS_1121, reference US EPA 5035 and 8015A);

PAHs: after extraction the sample is analysed by capillary column GC/MS. PAHs are normally analysed in selected ion monitoring (SIM) mode for enhanced sensitivity. The reporting level for soils is typically 0.1 µg/mL (AGAL internal method NGCMS_1111, reference US EPA 3510b, 8270);

SVOC Scan: Methods USA EPA SW846, 8270 is required by the EPA specifically for site validation. Environmental & Earth Sciences, together with AGAL, have adapted Method 8270 to serve as a suitable scanning test for investigations. The extraction is per 8270 and the GC/MS run is a modified 8270, however the data handling is not of the standard

8270 methodology. All data is saved to disk and anomalies above 1 to 5 ppm are interpreted as being present. An extended PAH scan is run as the standard and any detection above 5 ppm is analysed specifically and quantified. The modified 8270 scan Environmental & Earth Sciences wishes to utilise for this project is an acid leach. This will allow 95% of chlorinated phenols to be detected (method 8270 loses most chlorinated phenols under the standard procedure). The disadvantage of using the acid leach is that approximately a 10% loss of some pesticides will occur;

Total metals (As, Hg, Cd, Cr, Cu, Pb, Ni, Zn): 1 g soil digested with nitric perchloric acid for 10 minutes using microwave heating (crushed concrete ≤9 mm, and 1-2 mm fines used for digestion). Analysis by ICP/AES/MS, mercury analysis by Cold Vapour (SAL internal method M1 P3, M7 P3 and M3 P1, reference APHA 19th Edition 3111B, 3111C, 3112B, 3114B);

TSS: 100 mL water sample filtered through a wet 0.45 µm filter paper and dried for 1 hour at 104-105°C (SAL, APHA 19th Edition 2450D);

In addition to the above method descriptions, analysis was undertaken by AGAL for halogenated aliphatic compounds (AGAL internal method NGCMA_1120). Extraction and analysis by GC/MS is undertaken in a manner described for semi-volatile TPH fractions above. All other inorganic method procedures are as set out in the quality manual of SAL and AGAL laboratories and are available upon request.

TABLE 3

INORGANIC SOIL/WATER ANALYSIS - METHOD CODES/LLD'S

Parameter	Extraction (soils)	*Analysis (soils/waters)	mg/kg LLD (soils)	mg/L LLD (waters)
Total Solids		2540B	N/A	1
Suspended Solids		2540D	N/A	1
Total Dissolved Solids		2540C	N/A	1
Biochemical Oxygen Demand		5210B	N/A	5
Chemical Oxygen Demand		5220B	N/A	5
Turbidity		2130	N/A	0.1 NTU
Total Organic Carbon		5310B	N/A	0.1
Oil & Grease		5520D	N/A	1
Carbonate/Bicarbonate		2320B	N/A	1
Nitrite		4500B	N/A	0.1
Sulphide		4500B	N/A	0.1
Bromide		4500C	N/A	0.1
Organic Matter	Dichromate Oxidation	Walkley Black	100	N/A
Cation Exchange Capacity	Silver Thiourea Extraction	Pleysier & Juo	0.1 MEQ%	N/A
Exchangeable Cations	Silver Thiourea Extraction	Pleysier & Juo	0.01 MEQ%	N/A
Cu, Pb, Zn, Cd, Cr, Ni, Co, Fe, Mn, Ag, Na, K, Mg	US EPA 3050	3111B	0.5	0.01
Ca, Al, Ba, Sn, Ti, V, Mo	US EPA 3050	3111D	1	0.1
As, Se, Sb, Bi	US EPA 3050	3114B	0.5	0.01
Hg US EPA 7471	3112B	0.001	0.0001	
pH	1:5 Soil/Water Extract		4500HB	
Conductivity	1:5 Soil/Water Extract	2510	1 µS/cm	0.1 µS/cm
Ammonia	1:5 Soil/Water Extract	4500F	1	0.1
Fluoride	1:5 Soil/Water Extract	4500C	1	0.1
Chloride	1:5 Soil/Water Extract	4500D	5	1
Nitrate	1:5 Soil/Water Extract	4500C	1	0.1
Sulphate	1:5 Soil/Water Extract	DMR-$BaCrO_4$	5	1
Formaldehyde	1:5 Soil/Water Extract	Walker 1964	1	0.1
Thiocyanate	1:5 Soil/Water Extract	4500M	1	0.1
Phosphate	Colwell Extract	4500E	1	0.1
Total Phosphorous	HF/H_2SO_4 Digestion	4500BE	1	0.1
Total Organic Nitrogen	Distillation	4500B	10	1
Total Cyanide	Harwell UKAEA Nov 1981	4500CE	0.1	0.01
Free Cyanide	Harwell UKAEA Nov 1981	4500E	0.1	0.01
Total Phenolics	Harwell UKAEA Nov 1981	5530	0.1	0.01
Sulphide	High Temperature Furnace	4500E	10	0.1
Boron	1:5 Hot Water Extract	4500BB	5	0.1
Hexavalent Chromium	1:10 Phosphate Extract	3500D	1	0.1

Note: for method numbers refer to APHA 19th Edition

TABLE 4

INORGANIC SOIL/WATER ANALYSIS–METHOD DESCRIPTIONS

Parameter	Extraction Method	Analytical Method
Total Solids	Gravimetric 103-105°C	
Suspended Solids	Gravimetric 103-105°C	
Total Dissolved Solids	Gravimetric 180°C	
Biochemical Oxygen Demand	Oxygen Electrode	
Chemical Oxygen Demand	Reflux $K_2Cr_2O_7$ (2 hrs)	FAS Titration
Turbidity	Nephelometric	
Total Organic Carbon	TOC Analyser (GC)	
Oil & Grease	Reflux Freon (2 hrs)	Gravimetric 100-105°C
Carbonate/Bicarbonate	pH Titration	
Nitrite	Colour – Sulphanilamide	
Sulphite	Iodometric Titration	
Bromide	Ion Chromatography	
Organic Matter	$K_2Cr_2O_7$ Oxidation	FAS Titration
Cation Exchange Capacity	Silver Thiourea Extract	AAS – Flame
Exchangeable Cations	Silver Thiourea Extract	AAS – Flame
Cu, Pb, Zn, Cd, Cr, Ni, Co, Fe, Mn, Ag, Na, K, Mg	HNO_3/H_2O_2 Digestion HCl Leach	AAS – Flame
Ca, Al, Ba, Sn, Ti, V, Mo	As above	AAS – Flame (N_2O)
As, Se, Sb, Bi	As above	AAS – Hydride
Hg	Reflux HCl/HNO_3 Oxidation	AAS – Cold Vapour
pH	1:5 Soil/Water Extract (0.5 hr)	pH electrode
Conductivity	1:5 Soil/Water Extract (0.5 hr)	Conductivity
Ammonia	1:5 Soil/Water Extract (0.5 hr)	NH_3 Electrode
Fluoride	1:5 Soil/Water Extract (0.5 hr)	F Electrode
Chloride	1:5 Soil/Water Extract (0.5 hr)	Potentiometric Titration
Nitrate	1:5 Soil/Water Extract (0.5 hr)	Ion Chromatography
Sulphate	1:5 Soil/Water Extract (0.5 hr)	Colour – $BaCrO_4$
Formaldehyde	1:5 Soil/Water Extract (0.5 hr)	Colour – NASH Reagent
Thiocyanate Complex	1:5 Soil/Water Extract (0.5 hr)	Colour – Ferric
Phosphate	$NaHCO_3$ Extract (16 hrs)	Colour –
Molybdate		Ascorbic Acid Reduction
Total Phosphorus	HF/H_2SO_4 Digestion	Colour –
Molybdate		Ascorbic Acid Reduction
Total Organic Nitrogen	H_2SO_4 Digestion/ Distillation	NH_3 Electrode
Total Cyanide	0.2 N NaOH Extract (12 hrs)	Colour – Barbituric Acid
H_2SO_4		Colour – Barbituric Acid
Free Cyanide	0.2 N NaOH Extract (12 hrs)	
pH7	Distillation	
Total Phenolics	0.2 N NaOH Extract (12 hrs)	Colour – Aminoantipyrine
H_3PO_4	Distillation	
Sulphide	Furnace – 1 400°C	Iodometric Titration
Boron	1:5 Hot Water Extract	Colour – Curcumin
Hexavalent Chromium	KH_2PO_4 Extract (12 hrs)	Colour – Diphenylcarbazide

5.2 Method limitations

The following method limitations must be understood:

TPH C_6-C_9:
Analysis of TPH C_6-C_9 (AGAL internal method NGCMS_1121) is reported as total petroleum hydrocarbons (TPH). This analysis includes all methylene chloride/dichloromethane extractables (eg. phenols, PAHs, pesticides, BTEX, etc.), and may contain other non-petroleum type compounds which include natural organic compounds such as humic and fulvic acids. This limitation is used to advantage in data set quality assurance.

Semi-volatile TPH C_{10}-C_{36} surrogate:
Surrogate recoveries for semi-volatile TPH are generally considered as being inappropriate due to the non-target specific nature of the analysis. In addition, there is a significant possibility that surrogate spiking analytes would not be resolved from the FID detector response chromatogram in a positive sample, where the sample result is greater than the surrogate PQL/surrogate spike concentration ratio.

Filtered metals (As, Hg, Cd, Cr, Cu, Pb, Ni, Zn) and phosphate:
Environmental & Earth Sciences do not filter in the field or acidify samples. Acidification is undertaken in the field to lower the pH so that when Fe(II) is converted to Fe(III) iron peroxide is not precipitated. Other soluble metals and phosphate are co-precipitated and absorbed onto the amorphous iron hydroxide. Filtering removes colloidal matter prior to acidifying to prevent the release of adsorbed metals from colloids with pH variable charge and displacement by protons. Environmental & Earth Sciences field methods are undertaken to ensure that the sample is taken with minimal disturbance and minimal introduction of oxygen. Groundwater is pumped until Eh is stabilised, at which point the hose is carefully removed from the bottle whilst pumping is continued. No void space is left at the top of the sample and the sample is chilled and taken to the laboratory within 8 hours of sampling. When sampling occurs such that the samples cannot be at the laboratory within 8 hours, the samples are filtered (limited only to when TSS is less than 100 ppm) and acidified for heavy metals.

Preservation treatments and careful handling is unnecessary when Fe(II) concentration is less than $1x10^{-8}$ mg/L. This can be calculated for water in poorly weathered soils by:

$$\text{Log Fe(II)} = 15.75 - pe - 3pH$$

And for water in highly weathered soils and many rocks where goethite exists by:

$$\text{Log Fe(II)} = 13.04 - pe - 3pH$$

5.3 Procedures for anomalous samples and confirmation checking

All results are checked for discrepancies by the project manager, against the anticipated result and all other results, within 8 hours of receipt of the result.

Any result that is considered by the supervising scientist to be unusually high or at variance with other results is automatically re-analysed. A significantly different result requires immediate remedial action on the whole sample batch (retesting or using an alternative analytical method) at the laboratory's expense.

After appropriate checking by laboratories, all sample analysis results work-sheets, including those of duplicates and replicate analyses, are provided at least weekly to Environmental & Earth Sciences for checking. Any results requiring confirmation will be re-analysed at the laboratory's cost.

Soil is defined as that passing through a 2 mm sieve when air dry. The gravel fraction (that retained) is assumed to be inert. Analysis is undertaken on the less than 2 mm fraction where possible. This procedure is not possible for organics, and original laboratory sheets are reported on 'an as received' basis unless a correction has been applied.

All results of chemical analysis are analysed on an air dry weight basis and reported on an oven (105°C) dry weight basis, unless specified otherwise.

Once confirmation checking is completed the final laboratory report is issued.

6.0 DATA POINT VALIDATION

Data assessment was undertaken on samples documented in the chain of custody forms presented in Appendix B.

6.1 Sample integrity and containers

Chain of custody documentation were sighted and dated by AGAL and stated that all samples were received in good order and were presented in adequate sample containers. No correspondence from SAL was received stating that samples were not received in good order.

6.2 Holding times

Holding times for all analysis undertaken are presented in Table 5 :

TABLE 5

MAXIMUM HOLDING TIMES

Analyte	Dates received	Dates extracted	Dates analysed	Maximum holding time	Conclusion
Semi-volatile organics					
Petroleum hydrocarbons	19/12/02	20/12/02	20/12/02	30/14 days	correct
OCP	19/12/02	23/12/02	23/12/02	14 days	correct
Inorganics					
Heavy metals	19/12/02	-	08/01/03	6 months	correct

Holding times for all analysed samples were within the stipulated are correct.

6.3 Field duplicates

6.3.1 Number of field duplicates

The number of field duplicates for this project is reported in the Table 6:

TABLE 6

NUMBER OF FIELD DUPLICATES

Compound analysed	Number of analyses undertaken	Number of field duplicates
Organochlorine Pesticides	16	1
Copper, lead & zinc	10	1

The number of field duplicates complies with the requirements detailed in AS4482.1 and is therefore considered adequate for this project.

6.3.2 Relative percentage difference values

Blind duplicate samples were collected for both organic and inorganic compounds at this site and calculations of the relative percentage difference (RPD) values are presented below.

Table 7 contains the blind duplicate results for soil organic analysis for TPH and organochlorine pesticides, Table 8 contains the blind duplicate results for soil inorganic analysis. No exceedences of selected RPD values were noted in Tables 7 and 8, which therefore means that the duplicates are acceptable for this project.

TABLE 7

SOIL ORGANIC FIELD BLIND DUPLICATE QA/QC RESULTS

Sample	MDL	SS4	DUP1	RPD (%)	AcceptancCriteria
OCPs					
HCB	0.01	<0.01	<0.01	-	RPD <80-150%
Lindane	0.01	<0.01	<0.01	-	RPD <80-150%
Heptachlor	0.01	<0.01	<0.01	-	RPD <80-150%
Aldrin	0.01	<0.01	<0.01	-	RPD <80-150%
BHC	0.01	<0.01	<0.01	-	RPD <80-150%
Heptachlor epoxide	0.01	<0.01	<0.01	-	RPD <80-150%
Chlordane	0.01	<0.01	<0.01	-	RPD <80-150%
DDE	0.01	<0.01	<0.01	-	RPD <80-150%
Dieldrin	0.02	0.013	<0.01	26	RPD <80-150%
Endrin	0.01	<0.01	<0.01	-	RPD <80-150%
DDD	0.01	<0.01	<0.01	-	RPD <80-150%
DDT	0.01	<0.01	<0.01	-	RPD <80-150%
Methoxychlor	0.01	<0.01	<0.01	-	RPD <80-150%
Endosulfan	0.01	<0.01	<0.01	-	RPD <80-150%

Notes:
1. MDL method detection limit
2. AC acceptance criteria
3. BD field blind duplicate
4. RPD relative percentage difference
5. all units in mg/kg on a dry weight basis

TABLE 8

INORGANIC FIELD BLIND DUPLICATE QA/QC RESULTS

Sample	SS67	DUP2	RPD(%)	Acceptance criteria
Depth (m)	**0-0.1**			
Heavy Metals				
Copper	10	11	10	RPD <80-150%
Lead	19	21	10	RPD <80-150%
Zinc	51	52	2	RPD <80-150%
Cadmium	-	-	-	-
Chromium	-	-	-	RPD <80-150%
Nickel	-	-	-	RPD <80-150%
Arsenic	-	-	-	RPD <80-150%
Mercury	-	-	-	RPD <80-150%

Notes:
1. MDL method detection limit
2. FD field blind duplicate
3. RPD relative percentage difference
4. all units in mg/kg on a dry weight basis

6.4 Laboratory QA/QC

6.4.1 Surrogate recoveries

Surrogate recoveries and laboratory duplicates for all organic analyses undertaken were within acceptable laboratory error, and results are presented as part of the original laboratory transcript in Appendix B.

6.4.2 Blanks

For AGAL, the quality assurance reports presented with the laboratory certificates (report number ENVI10/021219) presented in Appendix B indicates that the laboratory method blanks were identified as being free of analyte concentrations above the reported EQLs, LORs or PQLs.

6.4.3 Laboratory sample duplicates

For AGAL, the quality assurance reports presented with the laboratory certificates in Appendix B indicates that the laboratory sample duplicate results meet the DQOs for the project.

For SAL, the quality assurance report presented indicates that a laboratory sample duplicate undertaken on sample SS67 met the DQOs for the project.

6.4.4 Matrix spikes and duplicate matrix spikes

For AGAL, the quality assurance report presented with the laboratory certificates in Appendix B indicates that sample spikes and duplicate matrix spikes for TPH and BTEX meet the DQOs for the project.

SAL undertakes analysis of certified reference material (BCSS-1), an international standard of known concentrations, as part of their internal QA/QC program. Results from SAL laboratory certificate (job number SAL12814) presented in APP B indicate that all results were within the DQOs for this project.

6.5 Data point QC/QA conclusions

The data can be accepted as being accurate, precise and reproducible.

7.0 DATA SET COMPARABILITY

7.1 Data compatibility

7.1.1 Definition

Data compatibility is authenticated by confirming that the laws of chemistry are upheld, that intra-laboratory analysis relationships are consistent, that observations and field measurements are in agreement with other field data and the laboratory data and that results are consistent with the geology, history and logic.

7.1.2 Chemical laws

BTEX did not exceed C_6-C_9 totals. Cations and anions have a balanced charge.

7.1.3 Comparison of field measurement, observation and laboratory data

Field observations and measurements correlated well with laboratory data in all instances.

7.1.4 Consistency of laboratory data with geology, history and logic

The organic and inorganic analyses are consistent with the geology, groundwater flow, known site history and previous investigations. No analysis is outside logical explanation.

7.1.5 Intra-laboratory analysis relationships

The following data relationships due to method procedure occurred:

— no data relationships due to method procedure occurred in organic compound analysis because non-detectable concentrations were found in all samples.

7.2 Data set conclusion

The laboratory data is consistent with the field observations, the geology of the site and the previous investigation results, and the laws of chemistry have been upheld. The data set is consistent, and the laboratory results can be seen as representative of the site condition.

The data can be accepted as being representative of samples taken from the site.

8.0 CONCLUSION

The following comments can be viewed as an overall summary of the quality of the analytical component for this project No 50212:

— sample integrity and container requirements were recorded on chain of custody documentation and laboratory sample receipt advice forms as being satisfactory; and

— sample extraction and analyses were performed within the required holding times for all analyses.

Analytical data reported by SAL and AGAL can be judged to have met the essential criteria for data quality commissioned by Environmental & Earth Sciences Pty Ltd for the project. In summary, data assessment involved the examination of laboratory results, COC documentation and field QC/QA data.

Laboratory surrogate recovery indicated that laboratory accuracy was acceptable. The matrix spike (duplicate) and laboratory batch recovery all meet the data quality objectives and are therefore acceptable. All laboratory QC/QA method blanks were found to be free of analyte concentrations above the reported LORs. Sample duplicate and laboratory batch RPD results indicated that sample precision was acceptable, given the nature of the contamination.

Field data was in agreement with laboratory data and both were internally coherent. Intra-laboratory relationships were found to be acceptable. Chemical laws were upheld. Therefore, data can be considered as representative.

In summary, the QC/QA data reported by SAL and AGAL for the documented soil samples were determined to be of sufficient quality to be considered acceptable to comply with the Environmental & Earth Sciences Pty Ltd quality protocols for the project, Report No 50212. This report has therefore concluded that the QC/QA data set and field duplicate results are free of systematic, method biases and field sampling errors, and the data is representative of the site conditions.

9.0 DEFINITIONS OF TERMS

The following terms are defined for use in this document:

ACCURACY	The closeness of agreement between an observed value and an accepted reference value. When applied to a set of observed values, accuracy will be a combination of a random component and of a common systematic error (or bias) component.
BATCH	A group of samples which behave similarly with respect to the sampling or the testing procedures being employed and which are processed as a unit. For QC purposes, if the number of samples in a group is greater than 20, then each group of 20 samples or less will all be handled as a separate batch.
BIAS	The deviation due to matrix effects of the measured value ($X_s - X_u$) from a known spiked amount. Bias can be assessed by comparing a measured value to an accepted reference value in a sample of known concentration or by determining the recovery of a known amount of contaminant spiked into a sample (matrix spike). Thus, the bias (B) due to matrix effects based on a matrix spike is calculated as: $B = (X_s - X_u) - K$ where: X_s = measured value for spiked sample; X_u = measured value for unspiked sample; and K = known value of the spike in the sample. Using the following equation yields the percent recovery $\%R = 100\ (X_s - X_u) / K$
BLANK	see Equipment Rinsate, Method Blank, Trip Blank.
CERTIFIED REFERENCE MATERIAL	Solid material or solution in which the concentration of analytes are known accurately within specified limits of confidence. Most commonly used for the analysis of metals in soils. Water CRM's are not stable over long periods and thus not recommended for routine analysis. These materials are very useful in monitoring digestion efficiencies, thus indicating whether or not "total" analyte concentration is being determined.
CONTROL SAMPLE	A QC sample introduced into a process to monitor the performance of the system.
DATA QUALITY OBJECTIVES (DQOs)	A statement of the overall level of uncertainty that a decision-maker is willing to accept in results derived from environmental data. This is qualitatively distinct from quality measurements such as precision, bias, and detection limit.
DATA VALIDATION	The process of evaluating the available data against the project DQOs to make sure that the objectives are met. Data validation may be very rigorous, or cursory, depending on project DQOs. The available data reviewed will include analytical results, field QC data and lab QC data, and may also include field records.

DUPLICATE	Laboratory duplicate samples measure precision, which is calculated as SD or RPD. Duplicates are collected in a single sample container in the field and are analysed as two separate extractions. %RPD is expressed as $\frac{(D1-D2)}{(D1+D2)/2}\times 100$ where: D1 = sample concentration; and D2 = duplicate sample concentration. Variation in duplicate results outside the RPD acceptance criteria (depending on analyte) may highlight problems with analyte stability, digestion / extraction procedures and cross contaminations. see also Matrix Duplicate, Field Duplicate, Matrix Spike Duplicate.
EQUIPMENT BLANK	see Equipment Rinsate.
EQUIPMENT RINSATE	A sample of analyte-free media which has been used to rinse the sampling equipment. It is collected after completion of decontamination and prior to sampling. This blank is useful in documenting adequate decontamination of sampling equipment.
ESTIMATED QUANTITATION LIMIT (EQL)	The lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions. The EQL is generally 5 to 10 times the MDL. However it may be nominally chosen within these guidelines to simplify data reporting. For many analytes, the EQL analyte concentration is selected as the lowest non-zero standard in the calibration curve. Sample EQLs are highly matrix-dependent. The EQLs in SW-846 (reference 1) are provided for guidance and may not always be achievable.
FIELD DUPLICATES	Independent samples which are collected as close as possible to the same point in space and time. They are two separate samples taken from the same source, stored in separate containers, and analysed independently. These duplicates are useful in documenting the precision of the sampling process.

LABORATORY CONTROL SAMPLE	A known matrix spiked with compounds representative of the target analytes. This is used to document laboratory performance. The laboratory control samples (LCS) or standard reference materials (SRMs) are an externally prepared and supplied reference material containing representative analytes under investigation. The LCS monitors long term accuracy and is reported as a %R. Matrix spike (MS) data may be substituted with LCS data where applicable. %R is expressed as $\frac{(SSR - SR)}{SA} \times 100$ where: SSR = spiked sample result; SR = sample result (blank); and SA = spike added.
MATRIX:	The component or substrate (eg, surface water. drinking water) which contains the analyte of interest.
MATRIX DUPLICATE	An intra-laboratory split sample which is used to document the precision of a method in a given sample matrix.
MATRIX SPIKE	An aliquot of sample spiked with a known concentration of target analyte(s). The spiking occurs prior to sample preparation and analysis. Environmental samples are spiked with laboratory grade standards to determine the interactive effects between the sample matrix and the analytes being measured. Matrix compounds and their concentration should be specified. Matrix spikes are reported as a %R. Spiking concentration is greater than the sample concentration but not usually greater than ten times the EQL. %R is expressed as $\frac{(SSR - SR)}{SA} \times 100$ where: SSR = spiked sample result; SR = sample result (blank); and SA = spike added.
MATRIX SPIKE DUPLICATES	Intra-laboratory split samples spiked with identical concentrations of target analyte(s). The spiking occurs prior to sample preparation and analysis. They are used to document the precision and bias of a method in a given sample matrix.

METHOD BLANK

An analyte-free matrix to which all reagents are added in the same volumes or proportions as used in sample processing. The method blank should be carried through the complete sample preparation and analytical procedure. The method blank is used to assess inherent analyte contamination or interferences over the whole analytical procedure, either from reagent quality or testing environment. The method blank (or reagent blank as it is also known) consists simply of an aliquot of de-ionised water that is carried through the entire testing procedure with each sample batch.
For a method blank to be acceptable for use with the accompanying samples, the concentration in the blank of any analyte of concern should not be higher than the highest of either:

1. the method detection limit, or
2. five percent of the regulatory limit for that analyte, or
3. five percent of the measured concentration in the sample.

METHOD DETECTION LIMIT (MDL)

The minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix type containing the analyte.
For operational purposes, when it is necessary to determine the MDL in the matrix, the MDL should be determined by multiplying the appropriate one-sided 99% t-statistic by the standard deviation obtained from a minimum of three analyses of a matrix spike containing the analyte of interest at a concentration three to five times the estimated MDL, where the t-statistic is obtained from standard references or the table below.

No. of samples:	t-statistic
3	6.96
4	4.54
5	3.75
6	3.36
7	3.14
8	3.00
9	2.90
10	2.82

Estimate the MDL as follows:

1. Obtain the concentration value that corresponds to:
   a an instrument signal / noise ratio within the range of 2.5 to 5.0, or
   b the region of the standard curve where there is a significant change in sensitivity (ie a break in the slope of the standard curve).
2. Determine the variance (S^2) for each analyte
3. Determine the standard deviation (s) for each analyte (square root of S^2)
4. Determine the MDL for each analyte as follows:
   MDL = $t_{(n-1,\ \alpha = 0.99)}$ (s)
   where $t_{(n-1,\ \alpha = 0.99)}$ is the one-sided t-statistic appropriate for the number of samples used to determine (s), at the 99 percent level.

ORGANIC-FREE REAGENT WATER	For volatiles, all references to water in the methods refer to water in which an interferant is not observed at the method detection limit of the compounds of interest. Organic-free reagent water can be generated by passing tap water through a carbon filter bed containing about 1 pound of activated carbon. A water purification system may be used to generate organic-free deionised water. Organic-free reagent water may also be prepared by boiling water for 15 minutes and, subsequently, while maintaining the temperature at 90°C, bubbling a contaminant-free inert gas through the water for 1 hour. For semivolatiles and nonvolatiles, all references to water in the methods refer to water in which an interferant is not observed at the method detection limit of the compounds of interest. Organic-free reagent water can be generated by passing tap water through a carbon filter bed containing about 1 pound of activated carbon. A water purification system may be used to generate organic-free deionised water.
PRECISION	The agreement among a set of replicate measurements without assumption of knowledge of the true value. Precision is estimated by means of duplicate / replicate analyses. These samples should contain concentrations of analyte above the MDL, and may involve the use of matrix spikes. The most commonly used estimates of precision are the relative standard deviation (RSD) or the coefficient of variation (CV). RSD = CV = 100 S / E(X), where: E(X) = the arithmetic mean of the X_i measurements, and S = variance; and the relative percent difference (RPD) when only two samples are available. RPD = 100 $[(X_1 - X_2) / \{(X_1 + X_2) / 2\}]$.
PROJECT	Single or multiple data collection activities that are related through the same planning sequence.
QUALITY ASSURANCE PROJECT PLAN (QAPjP)	An orderly assemblage of detailed procedures designed to produce data of sufficient quality to meet the data quality objectives for a specific data collection activity.
REAGENT BLANK	See Method Blank.
REAGENT GRADE	Analytical reagent (AR) grade, ACS reagent grade, and reagent grade are synonymous terms for reagents which conform to the current specifications of the Committee on Analytical Reagents of the American Chemical Society.
REAGENT WATER	Water that has been generated by any method which would achieve the performance specifications for ASTM Type II water. For organic analyses, see the definition of organic-free reagent water.
REFERENCE MATERIAL	A material containing known quantities of target analytes in solution or in a homogeneous matrix. It is used to document the bias of the analytical process.
REPLICATES	See Split Samples

SPLIT SAMPLES	Aliquots of sample taken from the same container and analysed independently. In cases where aliquots of samples are impossible to obtain, field duplicate samples should be taken for the matrix duplicate analysis. These are usually taken after mixing or compositing and are used to document intra or inter-laboratory precision. They are used to assess analytical precision and sample matrix effects, especially for soil samples where homogeneity may be a problem.
STANDARD ADDITION	The practice of adding a known amount of an analyte to a sample immediately prior to analysis. It is typically used to evaluate interferences.
STANDARD CURVE	A plot of concentrations of known analyte standards versus the instrument response to the analyte. Calibration standards are prepared by successively diluting a standard solution to produce working standards which cover the working range of the instrument. Standards should be prepared at the frequency specified in the appropriate section. The calibration standards should be prepared using the same type of acid or solvent and at the same concentration as will result in the samples following sample preparation. This is applicable to organic and inorganic chemical analyses.
STANDARD REFERENCE MATERIAL	See Laboratory Control Samples
SURROGATE	An organic compound which is similar to the target analyte(s) in chemical composition and behaviour in the analytical process, but which is not normally found in environmental samples. Surrogates are QC monitoring spikes, which are added to all field and QC/QA samples at the beginning of the sample extraction process in the laboratory, where applicable. Surrogates are closely related to the sample analytes being measured and are not normally found in the natural environment. Surrogates are measured as %R. %R is expressed as $\frac{(SSR - SR)}{SA} \times 100$ where: SSR = spiked sample result; SR = sample result (blank); and SA = spike added.
TRIP BLANK:	A sample of analyte-free media taken from the laboratory to the sampling site and returned to the laboratory unopened. A trip blank is used to document contamination attributable to shipping and field handling procedures. This type of blank is useful in documenting contamination of volatile organics samples.

10.0 ABBREVIATIONS

%R	Percent recovery
Al	Aluminium
As	ARSENIC
Ba	Barium
BCSS	British Columbia standard sediment
Bi	Bismuth
BTEX	Benzene, toluene, ethyl benzene, xylene
Ca	Calcium
Cd	Cadmium
Co	Cobalt
COC	Chain of custody
Cr	Chromium
Cu	Copper
DQO	Data quality objectives
DSCF	Data set comparability figure
EQL	Estimated quantitation limit
Fe	Iron
FID	Flame ionisation detector
GC/FID	Gas chromatography/ flame ionisation detector
GC/MS	Gas chromatography/mass spectrometer
Hg	Mercury
ICPAES/MS	Inductively coupled plasma atomic emission spectrometer/mass spectrometer
K	Potassium
LCS	Laboratory control samples
LLD	Lower limit of detection
LOR	Limit of reporting
Mg	Magnesium
Mn	Manganese
Mo	Molybdenum
NATA	National accreditation testing authority
Ni	Nickel
OC	Organochlorine pesticides
OP	Organophosphate pesticides
OVA	ORGANIC VAPOUR ANALYSIS
PAHs	Polycyclic aromatic hydrocarbons
Pb	Lead
PCBs	Poly-chlorinated biphenyls
PQL	Practical quantitation limit
QA	Quality assurance
QC	Quality control
RPD	Relative percent difference
Sb	Antimony
SD	Standard deviation
Se	Selenium

Sn	Tin
SRMs	Standard reference materials
SVOC	Semi volatile organic compounds
TCLP	Toxicity characteristic leachate procedure
Ti	Titanium
TPH	Total petroleum hydrocarbons
TSS	Total soluble salts
V	Vanadium
Zn	Zinc

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Annexure F
Onsite Effluent Disposal Report

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Job Number 084320

On-site Effluent Disposal

for

Proposed Caravan Park

235 River Street

Palmers Island, N.S.W.

January 2009

HOLMES & HOLMES PTY. LTD.
CHARTERED ENGINEERS (AUSTRALIA)
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Executive Summary

This report refers to an effluent disposal study at 235 River Street, Palmers Island, NSW, undertaken as part of a re-zoning application. The purpose of the study was to identify the required area of land to enable effluent disposal from the Proposed Caravan Park, so that sufficient area could be included in the re-zoning application.

It is noted that this development falls outside the scope of the Clarence Valley Council (CVC) guidelines which are designed for effluent disposal from domestic households. However, these guidelines, together with E.P.A. Guidelines (1998), DEC (2004) and AS 1547 are considered to be the best available tools to determine the effluent land disposal area required by the proposed Park.

The site is located adjacent to the Clarence river on Palmers Island. An area to the east of the proposed caravan park site was identified for the effluent land disposal area. Site and soil assessments conducted using EPA (1998) guidelines identified several moderate to significant limitations to be associated with this land. These are discussed in Sections 2 and 3.

The land area required for three typical effluent disposal methods was calculated using the best available data. It is assumed that at least secondary treatment and disinfection are included in the process. It is recommended that at least 3.14Ha of land be included in the rezoning application for the purposes of effluent disposal and associated buffers (20m from Yamba Street and 12m from other property boundaries). It is acknowledged that the ultimate treatment and disposal systems have not yet been designed for this development, however, the identified effluent disposal area of 3.14Ha should enable flexibility in system choice.

Additional recommendations are made in Section 6 and the need for a comprehensive operation and maintenance manual for the Park is detailed in Section 7.

Soil testing results and baseline water quality analysis of the groundwater encountered in boreholes are included in the Appendices.

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Holmes & Holmes Pty. Ltd.

Table of Contents

1 INTRODUCTION

Following a request from Resource Design & Management Pty. Ltd., an effluent disposal study was undertaken for the proposed development of a caravan park (the Park) at 235 River Street, Palmers Island for Mr Paul Reid (the Owner). This investigation forms part of the rezoning application for the proposed Park. It identifies the required land area to dispose of treated wastewater effluent generated by the development. This will allow a suitably sized area to be re-zoned appropriately.

The proposed Park is to be located on the site of an old caravan park on River Street. The development includes 53 cabin style self contained accommodations and 100 caravan sites. The current proposed layout is shown on Figure 1.1.

Discussions with the Owner indicate that reuse of treated effluent within the landscaping of the Park is anticipated, and hence a high level of treatment is proposed. However, the Owner acknowledges that during peak holiday periods there may be a need to dispose of the treated effluent in a dedicated area of land adjacent to the Park. Therefore, this study focuses on identifying the size of a land disposal area suitable for the entire peak wastewater loads of the Park.

A site inspection and field testing and sampling was undertaken on the 2nd December 2008, to determine the required soil parameters and to assess the site conditions in regard to suitability for the satisfactory on-site disposal of domestic-type effluent.

It is noted that this development falls outside the scope of the Clarence Valley Council (CVC) guidelines which are designed for effluent disposal from domestic households. However, these guidelines, together with E.P.A. Guidelines (1998), DEC (2004) and AS 1547 are considered to be the best available tools to determine the effluent land disposal area required by the proposed Park.

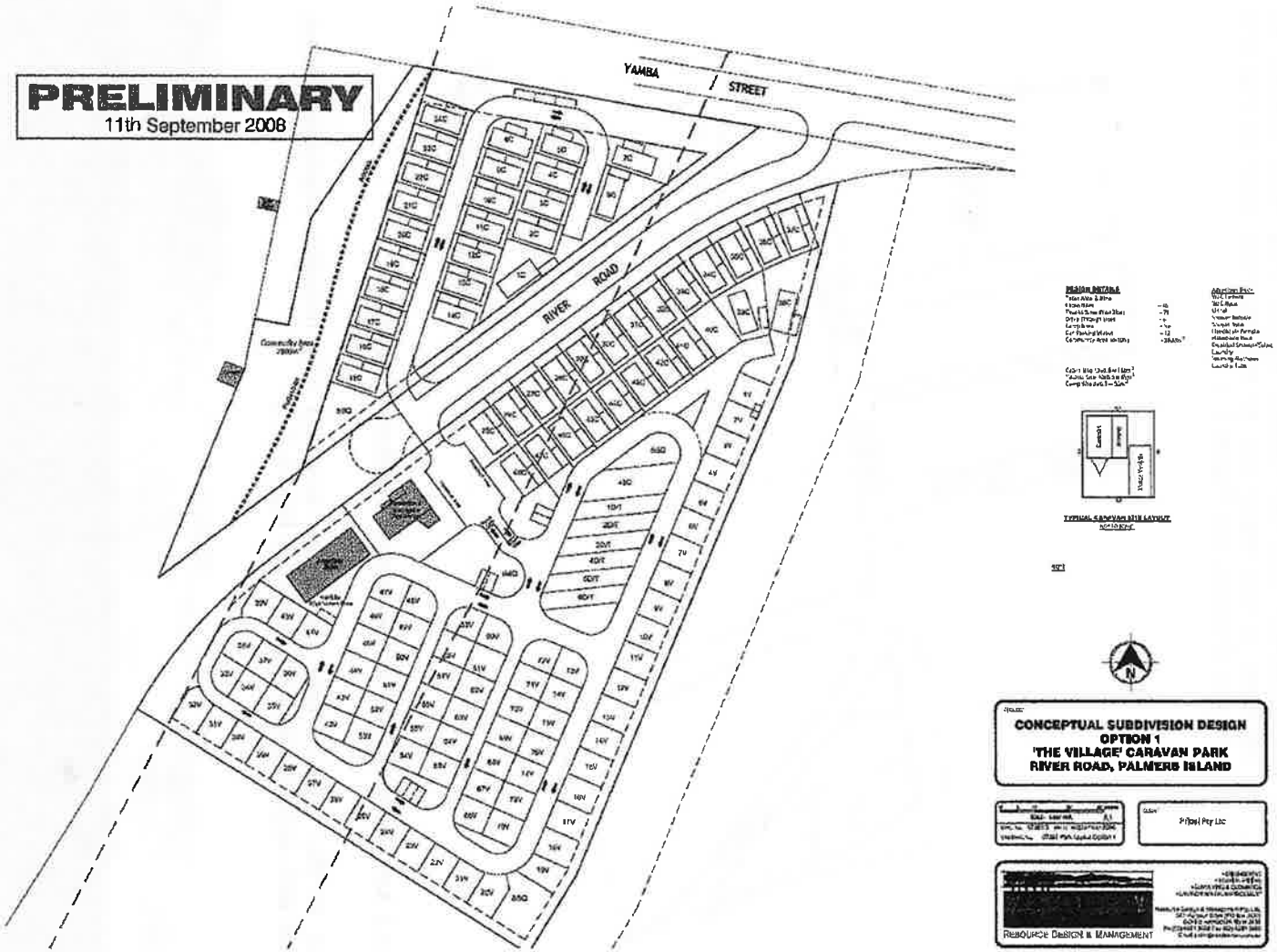


Figure 1.1 Current proposed layout of the Park (Source: RDM)

2 SITE ASSESSMENT

The proposed Park is bounded by the Clarence River along the western boundary and a formed bitumen road along the eastern boundary. To the east of this road is an area of land that has been cultivated with sugar cane for approximately 100 years. This land was identified, in consultation with the Owner, as the area most suitable for effluent disposal. The objective of this study was to identify how much of this land should be set aside for effluent disposal, see Figure 2.1.

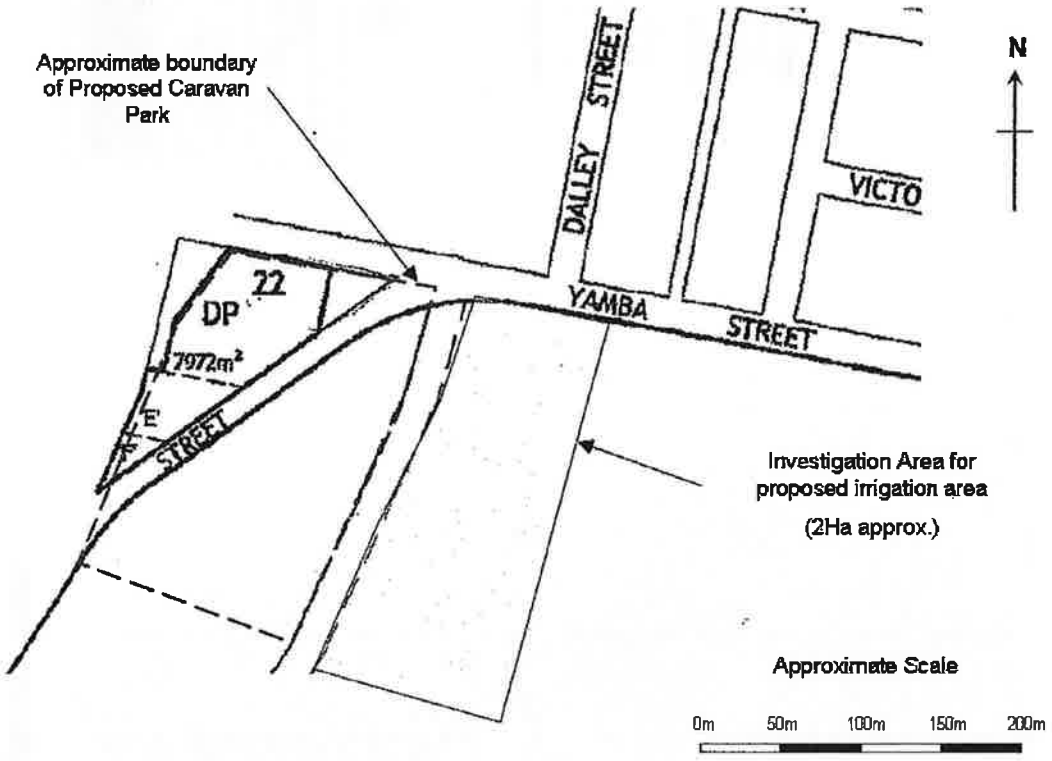


Figure 2.1 Location of land to be used for effluent disposal

The land in this area is very flat (laser levelled) and includes drainage ditches associated with sugar cane production, see Figure 2.2.

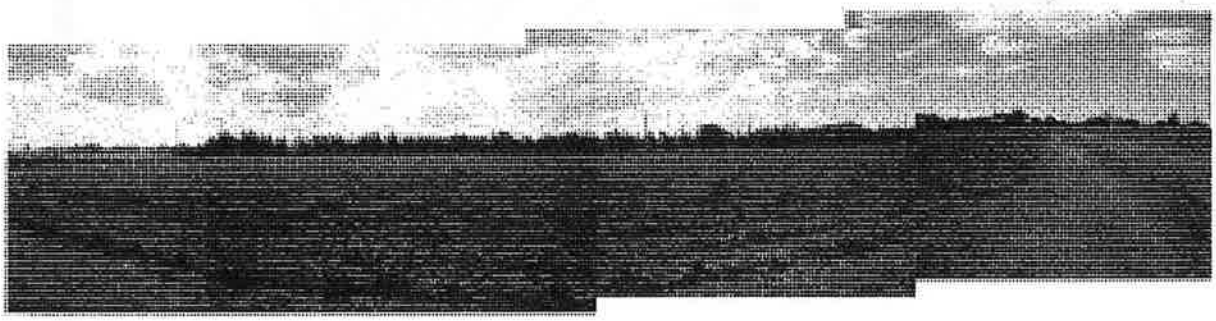


Figure 2.2 Current landuse in the area identified for effluent disposal (View from southeast corner)

A Detailed Site Assessment is shown on Table 2.2 which identifies the main constraints associated with use of the land for effluent disposal. These constraints are discussed and addressed in the following sections.

2.1 Flooding potential

The proximity to the river and the potential for the Park to be flooded can be addressed in the design of the collection and treatment systems (collection systems, settlement tanks, aeration tanks, electrical components, control systems etc.). The potential for the land disposal area to flood presents the possibility of treated effluent re-surfacing and entering the watercourses. This risk is minimised by the fact that the proposed treatment system will be to secondary level with disinfection and hence the health risk posed by the effluent will be reduced. Furthermore, during a flood event the dilution effect of floodwaters in the Clarence on any treated effluent mobilised in the land disposal area will be significant.

2.2 Proximity to groundwater table

The land disposal area is located on the flood plain of the Clarence river and so the groundwater level is close to the surface, at approximately 1.0m depth in the boreholes BH4 and BH5, some 200m from the river. The groundwater levels are approximately 300mm above river level at the time of measurement (high tide). Water levels in Boreholes 1 and 2 were observed to be influenced by the state of tide. The boreholes in the area proposed for effluent disposal (3, 4 and 5) were not visibly influenced by the tide and are more likely to be affected by the drainage ditches in the sugar cane field.

The disposal of effluent on the land area identified has the potential to impact on the water quality of the underlying groundwater. The two principle concerns in this locality are:

- Possible contamination of water used for potable supplies (sand aquifers layers behind natural levee). Groundwater bore searches on the NSW Natural Resource Atlas did not identify any domestic groundwater bores within 250m of the site. However, it is possible that un-licensed bores exist in the vicinity and that bores could be sunk the vicinity in the future. Pathogenic contamination (bacteria/viruses) is likely to be the most important issue to consider in relation to human health.

- Possible localised degradation of water quality of the Clarence river and adverse impacts on aquatic ecosystem. Nutrient loadings are the most important issues to consider for the protection of aquatic ecosystems.

The risk of such contamination is largely dependant on the treatment processes employed. As the Owner proposes to re-use wastewater within the Park, and hence employ a sophisticated treatment system including disinfection, it is assumed that the quality of the final effluent to be disposed of in the land disposal area will not pose a threat to the groundwater.

Two samples of groundwater were made from Boreholes 4 and 5 and were analysed for standard parameters with the view to establish baseline conditions, see Appendix A. The results suggest that the water is moderately acidic in nature, with high iron and manganese levels typical of oxygen deficient groundwater. The ANZECC (2000) default trigger values for the assessment of the risk of adverse effects due to nutrients, biodegradable organic matter and pH in Slightly Disturbed ecosystem are

shown on Table 2.1. The samples of existing groundwater fail to meet the pH, Ammonia, TP and TN criteria of these guidelines.

Table 2.1 Default trigger values for preservation of aquatic ecosystems – Slightly Disturbed condition. (ANZECC, 2000)

Ecosystem type	Chl *a*	TP	FRP	TN	NO_x	NH_4^+	DO (% saturation)[1]		pH	
	(µg L^{-1})	(µg P L^{-1})	(µg P L^{-1})	(µg N L^{-1})	(µg N L^{-1})	(µg N L^{-1})	Lower limit	Upper limit	Lower limit	Upper limit
Estuaries[2]	4[4]	30	5[4]	300	15	15	80	110	7.0	8.5

Notes Chl a = chlorophyll a, TP = total phosphorus, FRP = filterable reactive phosphate, TN = total nitrogen, NOx = oxides of nitrogen, NH4 + = ammonium, DO = dissolved oxygen.

2.3 Poor drainage

The lack of slope and drainage lines at the site will result in a high fraction of rainfall being retained on soil surface. Low permeability soils will lead to surface runoff during high rainfall events and waterlogging. The surface runoff may become contaminated with treated effluent if it has been applied to the surface of the soil or at shallow depth.

The problems associated with surface ponding or runoff containing treated effluent are reduced at this site by the fact that high levels of treatment are proposed. Hence, the quality of the treated effluent is high and health risks to humans from ponded/runoff water will be low.

Table 2.2 Site Assessment Summary: Rating for On-Site systems (Source: *Onsite sewage management for single households* EPA (1998))

Job number: 084320
Project: Proposed Caravan Park at 235 River Street, Palmers Island.
Location: Proposed land disposal area to east of River Street. River flat. Cleared land under sugar cane cultivation. Slope < 1%.

Site Feature	Relevant System(s)	Minor Limitation	Moderate Limitation	Major Limitation	Restrictive Feature
Flood potential	All land application systems	Rare, above 1 in 20 year flood contour		Frequent, below 1 in 20 year flood contour	Transport of wastewater off-site
	All treatment systems	All components above 1 in 100 year flood contour		Any components below 1 in 100 year flood contour	Transport of wastewater off-site. System failure and electrocution hazard
Exposure	All land application systems	High sun and wind exposure		Low sun and wind exposure	Poor evapotranspiration
Slope (%)	Surface irrigation	0-6	6-12	>12	Run-off, erosion
	Sub-surface irrigation	0-10	10-20	>20	Run-off, erosion
	Absorption system	0-10	10-20	>20	Run-off, erosion
Landform	All systems	Hill crests, convex side slopes and plains	Concave side slopes and foot slopes	Drainage plains and incised channels	Groundwater pollution hazard Resurfacing hazard
Run-on and upslope seepage	All land application systems	None - low	Moderate	High - diversion not practical	Transport of wastewater off-site.
Erosion potential	All land application systems	No signs of erosion potential present		Signs of erosion, eg rills, mass movement and slope failure, present	Soil degradation and transport, system failure
Site drainage	All land application systems	No visible signs of surface dampness		Visible signs of surface dampness, such as moisture-tolerant vegetation (sedges and ferns), and seepages, soaks and springs	Groundwater pollution hazard Resurfacing hazard
Fill	All systems	No fill	Fill present		Subsidence. Variable permeability
Buffer distance	Adsorption system	See Section 2.4			Health and pollution risks
Land area	All systems	Area is available		Area is not available	Health and pollution risks
Rocks and rock outcrops (%)	All land application systems	<10	10-20	>20	Limits system performance
Geology / regolith	All land application systems	None		Major geological discontinuities, fractured or highly porous regolith	Groundwater pollution hazard

2.4 Buffer distances

The minimum buffer distances applicable to the effluent disposal areas are:

- 250m from a domestic bore. A search of the NSW Resource Atlas found that no groundwater bores for domestic purposes were located within 250m of the identified disposal area.
- 40m to intermittent watercourses and farm dams. Not relevant
- Permanent watercourse. The proposed effluent disposal area is approximately 120m from the Clarence river at the closest point.
- It is recommended that a buffer of at least 20m be maintained from Yamba Street to reduce the potential impact on residents on the northern side of this street. A buffer of 12m (minimum) should be maintained along the southern and eastern property boundaries of the effluent disposal area. These buffers could include access tracks, drainage channels and vegetation screens.

Given the agricultural nature of this site and the lack of space constraints, the above buffer distances will be able to be achieved for the effluent disposal area.

3 Soil Assessment

Three field permeability tests were carried out in accordance with the procedures outlined in AS 1547 Appendix 4.1F, using a 110mm diameter hole, and a 38.7mm diameter tube. Locations of the permeability tests (P1, P2 and P3) and the investigation boreholes (BH1 to BH5) are illustrated on **Plan A**. Borelogs of all holes are shown on Table 3.1 and the field permeability results are shown on Table 3.2.

The soil conditions across the proposed land disposal area were found to be relatively uniform. A layer of topsoil (200mm to 600mm thick) was found above a layer of yellow/brown/grey silty clay (200mm to 300mm thick) which was located above the water table. The silty clay layer was underlain by a grey/yellow sandy clayey layer located at the level of the water table and became more sandy with depth.

Depths observed to groundwater level are also shown on Plan A. It should be noted that, given the impermeable nature of the soil, groundwater levels will fluctuate seasonally and in response to rainfall.

3.1 Soil Analysis Results

Three sample where analysed for soil parameters: 084320/1 (BH4 300mm-500mm), 084320/2 (BH4 800mm-1000mm) and 084320/3 (P2 200mm-450mm).

- **Upper soil layer:** 084320/1 and 084320/3 are considered to be representative of the material encountered at a depth of 200-500mm across the proposed land disposal area. This soil layer would be directly affected by the application of effluent in the land disposal area. Table 3.3 and Table 3.5 summarises the laboratory test results for these samples and Appendix B contains the full laboratory reports. The major limitations of this soil for effluent disposal use are shown below together with methods of addressing the issues:

- Strongly acidic soil which may limit plant growth. Soil may be improved by the addition of lime. Selection of acid-tolerant vegetation essential.
- A high level of exchangeable Aluminium was also found in this soil which can lead to plant toxicity. Reduction of soil acidity by liming will reduce the levels of available Aluminium. Selection of aluminium-tolerant vegetation essential.
- The soil shows the tendency to be dispersive with high ESP levels and Emerson Class 2 (Sample /1). The addition of gypsum will improve soil structure and permeability. Note the Emerson Class 4 for Sample /3 indicates calcite or gypsum is present in sample, possibly as a result of a previous gypsum application.

- **Lower soil layer:** 084320/2 is indicative of the more sandy material located below the upper layer of silty clays. This material would be affected by effluent percolating through the upper surface layers. The laboratory analysis of this sample is summarised on Table 3.4 and contained in full in Appendix B. The major limitations of this soil for effluent disposal use are shown below together with methods of addressing the issues:

  - Strongly acidic soil which may limit plant growth. Not practical to incorporate lime to this depth. If deep rooted vegetation adopted for disposal area, essential that acid-tolerant species are selected.
  - A moderate level of exchangeable Aluminium. Selection of aluminium-tolerant deep-rooted vegetation essential.
  - The soil shows the tendency to be dispersive with high ESP levels and Emerson Class 5 (dispersion of soil/water solution). The addition of gypsum to upper soil layer will improve soil structure and permeability of the lower layer to a degree.

Note that the soil testing results have been obtained solely for the purposes of this report and should not be regarded as indicative for the property as a whole. Further testing and consultation with a specialist would be required to establish the suitability of the land for the cultivation of specific crops/plants/trees.

3.2 Soil permeability results

The permeability test results are indicative of the upper soil horizon of topsoil and silty clay layers. The insitu permeability of the lower sandy layers was not determined due to the presence of the groundwater table.

The permeability test results on Table 3.2 show that the upper soil layers are highly impermeable and very low infiltration rates would be expected. This was confirmed by the field observation that water was still evident ponding on site several days after rain.

Table 3.1 Borelogs

ID	Depth (mm)	Soil Description
BH 1	00-600	Moist dark brown topsoil
	600-800	Mottled silty clay grey and yellow, moist
	800-1100	Mottled sandy clay, becoming more sandy with depth. Moist to wet.
	1200	End of hole
BH 2	00-600	Moist dark brown topsoil
	600-800	Mottled silty clay grey and yellow, moist
	800-1100	Mottled clayey sand, becoming more sandy with depth. Moist to wet.
	1100	End of hole
BH 3	00-300	Moist dark brown topsoil
	300-900	Mottled silty clay grey and yellow.
	900-1500	Mottled silty clay grey and yellow, moist.
	1500-1700	Mottled grey and yellow clayey sand, becoming more sandy with depth. Wet.
	1700	End of hole
BH 4	00-200	Moist dark brown topsoil
	200-500	Dark brown silty clay, few yellow mottles.
	500-700	Mottled grey and yellow sandy clay, becoming more sandy with depth. Moist to wet.
	700-1000	Mottled grey and yellow clayey sand, becoming more sandy with depth. Wet.
	1000-1600	Mottled grey and yellow sand with some clay. Saturated.
	1600	End of hole
BH 5	00-300	Moist dark brown topsoil
	300-650	Dark brown silty clay, few yellow mottles. Water seeping in at 400.
	650-1400	Mottled grey and yellow sandy clay, becoming more sandy with depth. Moist to wet. Saturated at 1000.
	1400-1500	Mottled grey and yellow clayey sand. Saturated.
	1500	End of hole
P1	00-350	Dark brown topsoil
	350-500	Dark brown and yellow grey silty clay
P2	00-400	Dark brown topsoil
	400-500	Dark brown and yellow grey silty clay
P3	00-450	Dark brown topsoil moist
	450-650	Dark brown and grey silty clay

Table 3.2 Field Permeability results

ID	Observed rate of fall (mm/min)	Calculated permeability K (m/d)
P1	0.16	0.0015
P2	0.03	0.0003
P3	0.03	0.0003

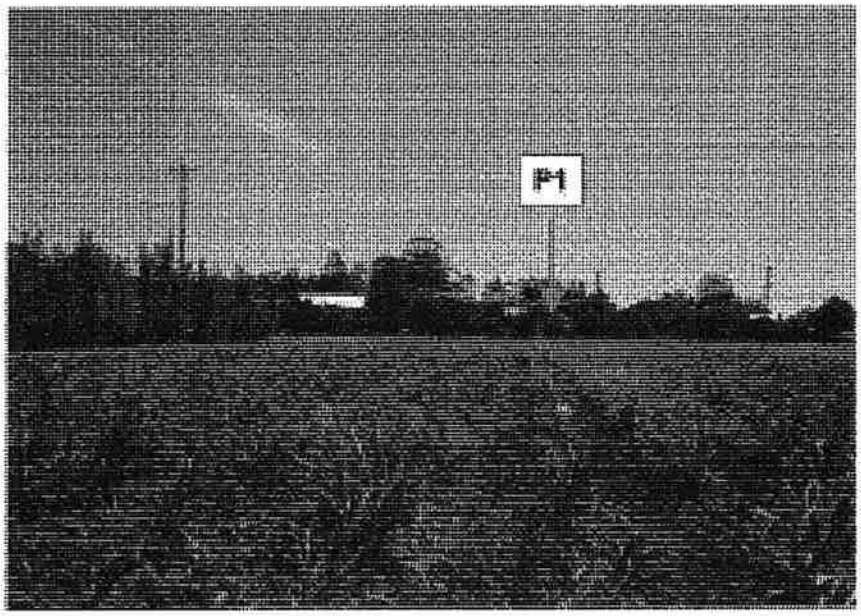


Figure 3.1 Location of permeability test P1 (looking north to Yamba St.)

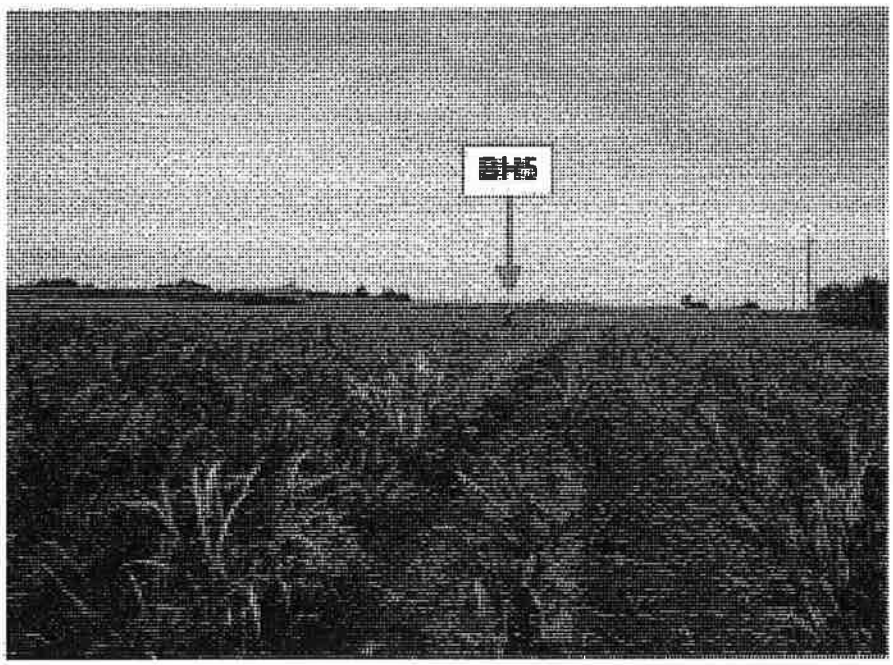


Figure 3.2 Location of borehole BH5 (looking south)

Table 3.3 Soil Assessment : Rating for On-Site systems (Source: *Onsite sewage management for single households* EPA (1998))

Sample: 084320/1
Project: Proposed Caravan Park at 235 River Street, Palmers Island.
Location: **Borehole 4 (300mm - 500mm)**
Soil Description: Dark brown silty clay, few yellow mottles.
Soil permeability category: 5c

Soil Feature	Relevant System(s)	Minor Limitation	Moderate Limitation	Major Limitation	Restrictive Feature
Depth to bedrock or hardpan (m)	Surface irrigation Sub-surface irrigation	>1.0	0.5-1.0	<0.5	Restricts plant growth (trees), excessive runoff, waterlogging
	Absorption	>1.5	1.0-1.5	<1.0	Groundwater pollution hazard Resurfacing hazard
Depth to high Episodic seasonal water-table (m)	Surface irrigation Sub-surface irrigation	>1.0	0.5-1.0	<0.5	Groundwater pollution hazard Resurfacing hazard
	Absorption	>1.5	1.0-1.5	<1.0	Potential for groundwater Pollution
Soil permeability category	Surface irrigation Sub-surface irrigation	2b, 3 and 4	2a, 5	1 and 6	Excessive run-off, waterlogging, percolation
	Absorption	3 and 4		1,2,5, and 6	
Coarse fragments	All land application systems	0-20%	20% - 40%	>40%	May restrict plant growth, affect trench installation
Bulk density (g/cm3)	All land application systems				Restricts plant growth, indicator of permeability
Sandy Loam		<1.8		>1.8	
Loam & clay loam		<1.6		>1.6	
Clay		<1.4		>1.4	
pH CaCl	All land application systems	>6.0	4.5-6.0	<4.5	Reduces optimum plant growth
Electrical conductivity (dS/m)	All land application systems	<4	4-8	>8	Excessive salt may restrict plant growth
Sodicity (exchangeable Sodium percentage)	Surface and sub-surface irrigation (0-40cm)	0-5	5-10	>10	Potential for structural degradation
	Absorption system (0-1.2m)				Potential for structural degradation
Cation exchange capacity (CEC) (cmol+/kg)	Surface irrigation Sub-surface irrigation	>15	5-15	<5	Unable to hold plant nutrients
Phosphorus sorption 100cm depth (kg/ha)	All land application systems	>6000	2000-6000	<2000	Unable to immobilise any excess P

Table 3.4 Soil Assessment : Rating for On-Site systems (Source: *Onsite sewage management for single households* EPA (1998))

Sample: 084320/2
Project: Proposed Caravan Park at 235 River Street, Palmers Island.
Location: **Borehole 4 (800mm - 1000mm)**
Soil Description: Mottled grey and yellow clayey sand, becoming more sandy with depth. Wet.
Soil permeability category: 3c

Soil Feature	Relevant System(s)	Minor Limitation	Moderate Limitation	Major Limitation	Restrictive Feature
Depth to bedrock or hardpan (m)	Surface irrigation Sub-surface irrigation	>1.0	0.5-1.0	<0.5	Restricts plant growth (trees), excessive runoff, waterlogging
	Absorption	>1.5	1.0-1.5	<1.0	Groundwater pollution hazard Resurfacing hazard
Depth to high Episodic seasonal water-table (m)	Surface irrigation Sub-surface irrigation	>1.0	0.5-1.0	<0.5	Groundwater pollution hazard Resurfacing hazard
	Absorption	>1.5	1.0-1.5	<1.0	Potential for groundwater Pollution
Soil permeability category	Surface irrigation Sub-surface irrigation	2b, 3 and 4	2a, 5	1 and 6	Excessive run-off, waterlogging, percolation
	Absorption	3 and 4		1,2,5, and 6	
Coarse fragments	All land application systems	0-20%	20% - 40%	>40%	May restrict plant growth, affect trench installation
Bulk density (g/cm3)	All land application systems				Restricts plant growth, indicator of permeability
Sandy Loam		<1.8		>1.8	
Loam & clay loam		<1.6		>1.6	
Clay		<1.4		>1.4	
pH CaCl	All land application systems	>6.0	4.5-6.0	<4.5	Reduces optimum plant growth
Electrical conductivity (dS/m)	All land application systems	<4	4-8	>8	Excessive salt may restrict plant growth
Sodicity (exchangeable Sodium percentage)	Surface and sub-surface irrigation (0-40cm)	0-5	5-10	>10	Potential for structural degradation
	Absorption system (0-1.2m)				Potential for structural degradation
Cation exchange capacity (CEC) (cmol+/kg)	Surface irrigation Sub-surface irrigation	>15	5-15	<5	Unable to hold plant nutrients
Phosphorus sorption 100cm depth (kg/ha)	All land application systems	>6000	2000-6000	<2000	Unable to immobilise any excess P

Table 3.5 Soil Assessment : Rating for On-Site systems (Source: *Onsite sewage management for single households* EPA (1998))

Sample: 084320/3
Project: Proposed Caravan Park at 235 River Street, Palmers Island.
Location: **P2 (200mm - 450mm)**
Soil Description: Dark brown topsoil
Soil permeability category: 5c

Soil Feature	Relevant System(s)	Minor Limitation	Moderate Limitation	Major Limitation	Restrictive Feature
Depth to bedrock or hardpan (m)	Surface irrigation Sub-surface irrigation	>1.0	0.5-1.0	<0.5	Restricts plant growth (trees), excessive runoff, waterlogging
	Absorption	>1.5	1.0-1.5	<1.0	Groundwater pollution hazard Resurfacing hazard
Depth to high Episodic seasonal water-table (m)	Surface irrigation Sub-surface irrigation	>1.0	0.5-1.0	<0.5	Groundwater pollution hazard Resurfacing hazard
	Absorption	>1.5	1.0-1.5	<1.0	Potential for groundwater Pollution
Soil permeability category	Surface irrigation Sub-surface irrigation	2b, 3 and 4	2a, 5	1 and 6	Excessive run-off, waterlogging, percolation
	Absorption	3 and 4		1,2,5, and 6	
Coarse fragments	All land application systems	0-20%	20% - 40%	>40%	May restrict plant growth, affect trench installation
Bulk density (g/cm3)	All land application systems				Restricts plant growth, indicator of permeability
Sandy Loam		<1.8		>1.8	
Loam & clay loam		<1.6		>1.6	
Clay		<1.4		>1.4	
pH CaCl	All land application systems	>6.0	4.5-6.0	<4.5	Reduces optimum plant growth
Electrical conductivity (dS/m)	All land application systems	<4	4-8	>8	Excessive salt may restrict plant growth
Sodicity (exchangeable Sodium percentage)	Surface and sub-surface irrigation (0-40cm)	0-5	5-10	>10	Potential for structural degradation
	Absorption system (0-1.2m)				Potential for structural degradation
Cation exchange capacity (CEC) (cmol+/kg)	Surface irrigation Sub-surface irrigation	>15	5-15	<5	Unable to hold plant nutrients
Phosphorus sorption 100cm depth (kg/ha)	All land application systems	>6000	2000-6000	<2000	Unable to immobilise any excess P

4 TREATMENT AND LAND DISPOSAL OPTIONS

It is recommended that, as a minimum, secondary treatment with disinfection be adopted for the proposed Park's wastewater treatment system. The benefits of adopting a high level of treatment for the Park include:

- Enabling partial re-use of wastewater within landscaping of the Park. Thus reducing the overall water demands of the Park.
- Reduced risk of odours being generated in the land disposal area.
- Reduced risk of contamination of the Clarence river during flood events as if treated effluent is re-mobilised from the land disposal area it will be of a high quality and hence impact on overall river-water quality less.
- Reduced risk of contamination of the Clarence river during non-flood periods via groundwater seepage, as the applied effluent will be of higher quality and the disinfection will remove the potential for pathogen contamination.

This investigation assumes that the treatment works for the Park will be designed and constructed in accordance with relevant standards and CVC conditions and will produce an effluent of secondary treatment standard. Current CVC guidelines indicate that secondary treatment must produce and effluent with less than 20mg/L BOD and less than 30 mg/L total suspended solids. DEC (2004) guidelines indicate that thermotolerant coliforms readings should be less than 10 ctu/100mL in effluent that is spray irrigated in unrestricted areas, which is appropriate for the proposed land disposal area.

Assuming that the effluent achieves the required levels of secondary treatment and disinfection, and after considering the site and soils assessment, possible land disposal options were reviewed:

- Above-ground spray irrigation: Not recommended due to proximity to proposed Park and existing residences in Yamba Street.

- Drippers under mulch: Not recommended due to the large area required and the potential for surface ponding.

- Sub-surface spray irrigation (SSI): Irrigation systems installed at shallow depth which distribute treated effluent evenly across disposal area, either for grasses/turf systems or discrete trees/shrubs. Proprietary systems are available and may be gravity-fed or pumped utilising pipework, indexing valves, scour valves, emitters etc. Sub-surface irrigation systems are assumed to be designed in accordance with AS1547 and specific CVC conditions. Typical section assumed to be 100mm of topsoil over 200mm depth of distribution medium (sand).

- Micro-trenching (MT): Modified form of sub-surface irrigation utilising shallow, narrow trenches filled with aggregate. These systems are assumed to be designed in accordance with CVC specification and AS1547. Typical section assumed to be 100mm of topsoil over 200mm depth of aggregate in a trench 300mm wide. 25m maximum length for trench if system pressurised, 10m maximum length if gravity fed. Parallel trenches are assumed to be at a spacing of 1000mm sidewall-to-sidewall.

- Evapotranspiration/Adsorption (ETA) beds: Utilising evapotranspiration via vegetation plantings and soil adsorption characteristics. Evapotranspiration beds are assumed to be constructed in accordance with AS1547 and specific CVC conditions. The typical section assumed consists of a 450mm deep bed (100mm topsoil over 200mm sand, over 200mm gravel, over 50mm sand) in a bed

1500mm wide. Minimum of two distribution pipes per 1500mm wide bed. Maximum length of bed 20m (centrally fed) 15m (end fed). Parallel beds are assumed to be at a spacing of 1000mm sidewall-to-sidewall.

- Adsorption trenches – Not recommended due to poor soil characteristics.

It is noted that the above list is not exhaustive and has been designed to identify an appropriate (and conservative) land disposal area required to meet the re-zoning objective of this investigation.

5 Estimation of Land Area Required for Effluent Disposal

5.1 Wastewater Loads

The maximum domestic effluent loadings for this development were derived assuming the Park would contain 53 cabin style self contained accommodations and 100 caravan sites (as proposed at time of reporting). The Park will be connected to town water and is expected to be fully serviced. Peak loadings (assuming full occupancy) were developed using AS1547 and are summarised on Table 5.1.

Note that the loading recommended by AS1547 has been increased from 100 to 130l/p/d for the cabin accommodations as a conservative measure, based on local experience.

It is assumed that the cabin accommodations and the shared amenity blocks in the Park will be fitted with standard water saving devices.

It is noted that the loadings for the Park are expected to be seasonal which will provide the opportunity to rest parts of the effluent disposal field.

Table 5.1 Assumed effluent loadings

Unit	Assumed Occupancy (p/unit)	Number of units	AS1547 Loading (l/unit/d)	Total daily load (l/d)
Cabin	3	53	390	20 670
Caravan site	3	100	300	30 000
			Total	**50 670**

5.2 Soil Design Loading Rates

The insitu permeability measurements, soil descriptions and AS1547 were used to estimate a Design Loading Rate (DLR) for each disposal system, see Table 5.2.

Table 5.2 Design Loading Rates adopted

Design K (m/d)	AS1547 Soil Category	Subsurface Irrigation	Micro Trenching	ETA Beds
		DLR (mm/week)	DLR (mm/d)	DLR (mm/d)
0.0007	5c	15	5	5

5.3 Land disposal area sizing

Full water balance calculation was performed as per the Nominated Area Method (EPA, 1998) to determine appropriate effluent disposal area based on the hydraulic loading for each of the options considered. The climate data used consisted of the long term rainfall statistics averaged from Grafton Research Stn (1917-2008) and Ballina Airport (1992-2008), see Figure 5.1. Evaporation data from Coffs Harbour was used. Full calculations are shown on Figure 5.2 to Figure 5.4.

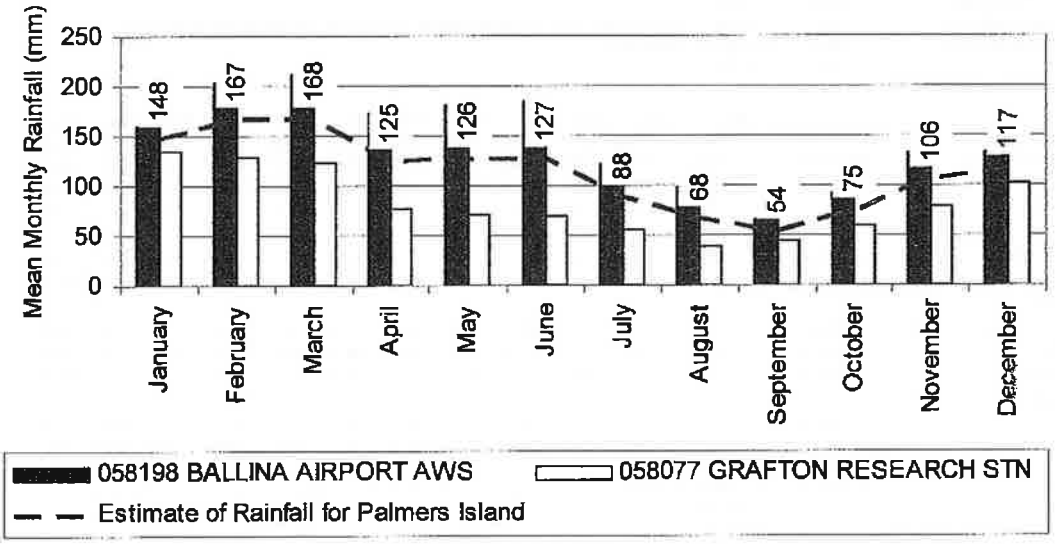


Figure 5.1 Long term monthly rainfall estimates for Palmers Island

These results summarised on Table 5.3 also include a calculations of the typical "footprint" of the land disposal area (ie. including sidewall-to-side wall spacing for micro-trenches etc.) based on the typical arrangements detailed in Section 4, and assuming an area of land 200m long is available.

Table 5.3 Summary of land disposal area sizes

Land Disposal Method	DLR (mm/d)	Disposal Surface required (m^2)	Typical Layout and Footprint required
SSI	2.14	31800	Area required = 3.18Ha (200m x 159m) (D_{tot} = 300mm)
Micro trenches	5	11400	Total footprint = 2.45Ha (200m x 123m) (D_{tot} = 300mm, W = 300mm, Spacing 1000mm)
ETA	5	10600	Total footprint = 1.42Ha (200m x 71m) (D_{tot} = 500mm, W = 3000mm, Spacing 1000mm)

The results show that up to approximately 3.2Ha of land could be required for effluent disposal, depending on the system adopted.

Project	**084320 - Onsite Effluent Disposal by: Sub Surface Irrigation.**
Location	Palmers Island, NSW
Date	Site Visit 2nd December 2008
Method	Nominated Area Method (EPA, 1998)
Sample Number	**084320/1 and 084320/3**
Soil Description	Topsoil and silty clay
Field Permeability	0.0007m/d (average of P1, P2 and P3)
Soil Permeability Category	5c (EPA, 1998)
Notes	Rainfall Average of BOM record for Grafton Research Stn (1917-2008) and Ballina Airport (1992-2008). Pan Evaporation Coffs Harbour (1968-2008)

Parameter	**Units**	**Value**	
Design Wastewater Flow	l/d	50760	All wasteweter from: 53 cabins (3 p/cabin @ 130l/p/d) 100 sites (3p/site @ 100l/p/d)
Design Percolation Rate	mm/d	2.14285714	15mm/week
Area	m2	31779	
Fraction of rainfall retained		0.8	

		Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Raw Precipitation	mm/month	**147.8**	**166.7**	**167.7**	**124.8**	**126.1**	**127.2**	**88.0**	**58.2**	**54.3**	**75.5**	**106.1**	**116.8**
Retained Precipitation	mm/month	**118.2**	**133.4**	**134.2**	**99.9**	**100.8**	**101.8**	**70.4**	**54.6**	**43.4**	**60.4**	**84.8**	**93.4**
Evaporation	mm/month	**195.3**	**159.6**	**151.9**	**120.0**	**86.8**	**72.0**	**77.5**	**108.5**	**138.0**	**164.3**	**174.0**	**198.4**
Crop Factor		0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
INPUTS													
Effluent irrigation	mm/month	49.5	44.7	49.5	47.9	49.5	47.9	49.5	49.5	47.9	49.5	47.9	49.5
Net Input	mm/month	167.8	178.1	183.7	147.8	150.4	149.7	119.9	104.1	91.4	109.9	132.8	142.9
OUTPUTS													
Effective Evaporation	mm/month	136.7	111.7	106.3	84.0	60.8	50.4	54.3	76.0	96.6	115.0	121.8	138.9
Percolation	mm/month	66.4	60.0	66.4	64.3	66.4	64.3	66.4	66.4	64.3	66.4	64.3	66.4
Net Outputs	mm/month	203.1	171.7	172.8	148.3	127.2	114.7	120.7	142.4	160.9	181.4	186.1	205.3
STORAGE													
Storage	mm/month	-35.4	6.4	10.9	-0.4	23.2	35.0	-0.8	-38.3	-69.5	-71.6	-53.3	-62.4
Cumulative Storage	mm/month	0.0	6.4	17.3	16.8	40.0	75.0	74.2	35.9	0.0	0.0	0.0	0.0

Max depth	mm	75.0	
Volume	m3	**2383.22**	
Assumed effective porosity (n)		**0.3**	For trench material (Blue metal or similar)
Total depth required	mm	**250**	Max depth of effluent
Assumed DEPTH OF IRRIGATIO	m	**0.3**	
Assumed FREEBOARD	m	**0.05**	Depth is greater than D + Freeboard

Figure 5.2 Water Balance calculation: Sub-Surface Irrigation

Project	**084320 - Onsite Effluent Disposal by: Micro Adsorption Trench**
Location	Palmers Island, NSW
Date	Site Visit 2nd December 2008

Method	Nominated Area Method (EPA, 1998)
Sample Number	084320/1 and 084320/3
Soil Description	Topsoil and silty clay
Field Permeability	0.0007m/d (average of P1, P2 and P3)
Soil Permeability Category	5c (EPA, 1998)
Notes	Rainfall Average of BOM record for Grafton Research Stn (1917-2008) and Ballina Airport (1992-2008). Pan Evaporation Coffs Harbour (1968-2008)

Parameter	Units	Value	
Design Wastewater Flow	l/d	50760	All wastewater from: 53 cabins (3 p/cabin @ 130l/p/d) 100 sites (3p/site @ 100l/p/d)
Design Percolation Rate	mm/d	5	
Area	m2	11366	
Fraction of rainfall retained		0.8	

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Raw Precipitation	mm/month	147.8	168.7	167.7	124.9	126.1	127.2	88.0	68.2	54.3	75.5	106.1	116.8
Retained Precipitation	mm/month	118.2	133.4	134.2	99.9	100.8	101.8	70.4	54.6	43.4	60.4	84.8	93.4
Evaporation	mm/month	195.3	159.6	151.9	120.0	86.8	72.0	77.5	108.5	138.0	164.3	174.0	198.4
Crop Factor		0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
INPUTS													
Effluent irrigation	mm/month	138.1	124.7	138.1	133.6	138.1	133.6	138.1	138.1	133.6	138.1	133.6	138.1
Net Input	mm/month	256.3	258.1	272.2	233.5	238.9	235.4	208.4	192.6	177.1	198.4	218.5	231.5
OUTPUTS													
Effective Evaporation	mm/month	136.7	111.7	106.3	84.0	60.6	50.4	54.3	76.0	96.6	115.0	121.8	138.9
Percolation	mm/month	155.0	140.0	155.0	150.0	155.0	150.0	155.0	155.0	150.0	155.0	150.0	155.0
Net Outputs	mm/month	291.7	251.7	261.3	234.0	215.8	200.4	209.3	231.0	246.6	270.0	271.8	293.9
STORAGE													
Storage	mm/month	-35.4	6.4	10.9	-0.5	23.2	35.0	-0.8	-38.3	-69.5	-71.6	-53.3	-62.4
Cumulative Storage	mm/month	0.0	6.4	17.3	16.8	40.0	75.0	74.1	35.8	0.0	0.0	0.0	0.0

Max depth	mm	75.0	
Volume	m3	854.23	
Assumed effective porosity (n)		0.3	For trench material (Blue metal or similar)
Total depth of trench required	mm	250	Max depth of effluent
Assumed DEPTH	m	0.3	
Assumed FREEBOARD	m	0.05	Trench depth is greater than D + Freeboard
Assumed WIDTH	m	0.3	
Length of trench	m	18993	Required trench length (L=A/(W+D)) (m) for TRENCH

Figure 5.3 Water Balance calculation: Micro Trenches

Project	**084320 - Onsite Effluent Disposal by: Evapotranspiration Adsorption (ETA) Bed**
Location	Palmers Island, NSW
Date	Site Visit 2nd December 2008
Method	Nominated Area Method (EPA, 1998)
Sample Number	**084320/1 and 084320/3**
Soil Description	Topsoil and silty clay
Field Permeability	0.0007m/d (average of P1, P2 and P3)
Soil Permeability Category	5c (EPA, 1998)
Notes	Rainfall Average of BOM record for Grafton Research Stn (1917-2008) and Ballina Airport (1992-2008). Pan Evaporation Coffs Harbour (1968-2008)

Parameter	Units	Value	
Design Wastewater Flow	l/d	50760	All wastewater from: 53 cabins (3 p/cabin @ 130l/p/d) 100 sites (3p/site @ 100l/p/d)
Design Percolation Rate	mm/d	5	
Area	m2	10597	
Fraction of rainfall retained		0.8	

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Raw Precipitation	mm/month	**147.6**	**166.7**	**167.7**	**124.9**	**126.1**	**127.2**	**88.0**	**68.2**	**54.3**	**75.5**	**106.1**	**116.8**
Retained Precipitation	mm/month	**118.2**	**133.4**	**134.2**	**99.9**	**100.8**	**101.8**	**70.4**	**54.6**	**43.4**	**60.4**	**84.8**	**93.4**
Evaporation	mm/month	**195.3**	**159.6**	**151.9**	**120.0**	**86.8**	**72.0**	**77.5**	**108.5**	**138.0**	**164.3**	**174.0**	**198.4**
Crop Factor		0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
INPUTS													
Effluent Irrigation	mm/month	148.5	134.1	148.5	143.7	148.5	143.7	148.5	148.5	143.7	148.5	143.7	148.5
Net Input	mm/month	266.7	267.5	282.7	243.6	249.3	245.5	218.9	203.1	187.1	208.9	228.5	241.9
OUTPUTS													
Effective Evaporation	mm/month	136.7	111.7	106.3	84.0	60.8	50.4	54.3	76.0	96.6	115.0	121.8	138.9
Percolation	mm/month	155.0	140.0	155.0	150.0	155.0	150.0	155.0	155.0	150.0	155.0	150.0	155.0
Net Outputs	mm/month	291.7	251.7	261.3	234.0	215.8	200.4	209.3	231.0	246.6	270.0	271.8	293.9
STORAGE													
Storage	mm/month	-25.0	15.8	21.3	9.6	33.6	45.1	9.6	-27.9	-59.5	-61.2	-43.3	-52.0
Cumulative Storage	mm/month	0.0	15.8	37.1	46.7	80.3	125.3	134.9	107.0	47.6	0.0	0.0	0.0

Max depth	mm	134.9	
Volume	m3	**1429.92**	
Assumed effective porosity (n)		**0.3**	For trench material (Blue metal or similar)
Total depth of trench required	mm	**450**	Max depth of effluent
Assumed DEPTH	m	**0.5**	500mm deep bed (100mm topsoil over 150mm sand, over 200mm gravel, over 50mm sand)
Assumed FREEBOARD	m	**0.05**	Trench depth is greater than D + Freeboard
Assumed WIDTH	m	**3**	
Length of bed	m	3532	Required trench length (L=A/(W)) (m) for BEDS

Figure 5.4 Water Balance calculation: Evapotranspiration/Adsorption Beds

6 CONCLUSIONS AND RECOMMENDATIONS

This investigation concludes that the disposal of domestic type effluent from the Proposed Park is possible on an area of land to the east of the Park. The wastewater treatment works should treat the effluent to at least secondary levels and a disinfection system should be employed. The analysis has shown that up to 3.2Ha could be required for the effluent disposal area. However, given the significant site and soil constraints of this site the final design of a suitable land disposal area is likely to comprise of a specialised system. This system is likely to utilise primarily evapotranspiration to remove the volume of treated effluent, plant uptake to remove nutrients and a filter medium (eg. sand layers in an ETA bed or mound system) to assist in polishing the effluent. Therefore it is considered likely that less than the 3.2Ha will be required for effluent disposal. It is recommended that a minimum 2.5Ha be set aside for an effluent disposal field (say, 200m X 125m) and a further 0.64Ha (approximately) will be required for the buffers on the northern (20m buffer), southern (12m buffer) and eastern (12m buffer) boundaries. Hence, at least 3.14Ha in total should be included in the rezoning application, for effluent disposal purposes. This should allow flexibility in the ultimate land disposal method adopted for the Park.

Other issues relevant to the wastewater treatment and effluent disposal systems for the proposed Park are briefly detailed below and may require further investigation prior to design/construction:

- Given various site and soil constraints identified at this location, it is recommended that the development of the Park should implement all methods of reducing wastewater loads including, but not limited to:
  - Installing the highest level of water efficient devices (showers, toilets, washing machines etc.)
  - Maximising reuse of treated effluent within the landscaping of the Park
  - Consideration should be given to installing a split grey/blackwater system to enable more efficient re-use and reduced disinfection requirements.
- All components of the wastewater treatment and disposal systems should be designed to manage seasonal fluctuations in wastewater loads (holiday periods etc.).
- All components of the wastewater treatment and disposal systems should be designed in light of the significant flood potential of the site.
- All components of the wastewater treatment and disposal systems should be designed and constructed in accordance to relevant CVC conditions, Australian Standards and NSW Health regulations.
- The soils at this location are acidic, low permeability soils with a tendency to be dispersive. Improvement of the soils will be required over the land disposal area and may include; import of sandy material (to improve the soil texture), addition of lime (to reduce acidity) and addition of gypsum (to reduce potential for dispersion). Vegetation species for evapotranspiration-assisted disposal systems should be chosen to suit the specific soil conditions on site.
- The land disposal area should be operated in a number of sections, to allow areas to be "rested" during low loading periods.
- Given the flat nature of the land, irrigation systems and gravity-fed disposal systems must be designed to ensure an even distribution of effluent over the entire land disposal area.
- Buffers of 12m should be maintained around the land disposal area and a buffer of 20m should be maintained from Yamba Street. These buffers should be planted with suitable vegetation to assist in nutrient removal and also provide screening. They may also contain access track and drainage.

- There is a potential for acid sulphate soils to exist at this location. Appropriate investigations may be required prior to excavations on-site.

7 MANAGEMENT, OPERATION AND MAINTENANCE

The management, maintenance and monitoring of the wastewater treatment and effluent disposal system for the Park will be critical to the its successful operation. It is essential that a comprehensive operation and maintenance manual be developed to accompany the final systems adopted. The manual should include emergency plans to cover possible system failure scenarios. Monitoring regimes should be developed in consultation with the relevant authorities to ensure the quality of the effluent is maintained and the receiving environment is not adversely impacted.

References

E.P.A. Guidelines. (1998). "Environment & Health Protection Guidelines: Onsite sewage management for single households".

Australian Standard 1547 (2000). Onsite domestic wastewater management.

Department of Environment and Conservation (DEC) NSW. (2004). "Environmental Guidelines: Use of Effluent by Irrigation".

Appendix A

Water quality test results from groundwater sampled at Borehole 4 and 5

COFFS HARBOUR LABORATORY

HOMLES AND HOLMES
P.O. BOX 3159
COFFS HARBOUR NSW 2450

BATCH NUMBER: 08/2361
No. of SAMPLES: 2
DATE COLLECTED: 2/12/08
DATE RECEIVED: 3/12/08
TIME RECEIVED: 10:30

ANALYTICAL REPORT

SAMPLE REFERENCE	SAMPLE DESCRIPTION
08/2361/1	BORE HOLE 4
08/2361/2	BORE HOLE 5

ANALYSIS	METHOD NO	UNITS	08/2361/1	08/2361/2
pH	APHA 4500-H+ B	pH unit	6.3	5.0
Temperature		°C	21	21
Total Dissolved Solids	EL7D	mg/L	222	186
Conductivity	APHA 2510 B	µS/cm	443	371
Salinity	EL6	ppt	0.3	0.3
Turbidity	APHA 2130 B	NTU	> 5.000	> 5.000
Calcium Hardness as CaCO3	APHA 3125 B	mg CaCO3/L	116	24
Alkalinity as CaCO3	APHA 2320 B	mg/L	113	12
Nitrite Nitrogen	APHA 4500-NO3 I	mg/L	0.54	<0.05
Nitrate Nitrogen	APHA 4500-NO3 I	mg/L	1.69	0.17
Oxidized Nitrogen	APHA 4500-NO3 I	mg/L	2.23	0.17
Ammonia Nitrogen	APHA 4500-NH3 H	mg/L	0.93	0.07
Total Nitrogen	APHA 4500-N C	mg/L	43.1	13.3
Total Phosphorus	APHA 4500-P H	mg/L	1.50	0.39
Iron	APHA 3125 B	mg/L	108	201
Manganese	APHA 3125 B	mg/L	0.72	0.98
Copper	APHA 3125 B	mg/L	0.38	0.34
Faecal Coliforms	APHA 9222 D	cfu/100mL	**	**
Langelier Index			-1.5	-4.5

Comments
This Amended report replaces report signed 03.10.07.
* Sample Over range due to high turbidity and will be re sampled and repeated.
**Due to high turbudity and percentage solids in samples, unable to perform membrane filtration technique.
Sample(s) collected by client and analysed as received.
Analysis performed according to "Standard Methods for the Examination of Water & Wastewater", 21st Edition. 2005. APHA.
Raw data sheets stating analysis dates are available upon request.

Approved: _____ 5 January 2009
B J Wadleigh
Laboratory Manager

NATA

This document is issued in accordance with NATA's accreditation requirements

Accredited for compliance with ISO/IEC 17025
(Accreditation Numbers 12359 (Chemical) & 14565 (Microbiological))

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards

Appendix B: Soil Laboratory Results

WASTEWATER DISPOSAL SOIL ASSESSMENT (Page 1 of 1)

3 soil sample from Holmes and Holmes supplied on 5th December, 2008 - Lab Job No. A1309
Analysis requested by Matt. Your Reference:4320

	SITE 1 4320/1- 300-500	SITE 2 4320/2- 800-1000	SITE 3 4320/3- 200-450
Job No.	*A1309/1*	*A1309/2*	*A1309/3*
Description	Heavy Clay	Sandy Clay	Clay Loam
Modified Emerson Aggregate Test [note 12]	Aus. Std. Class 2	Aus. Std. Class 5	Aus. Std. Class 4
Soil pH (1:5 $CaCl_2$)	4.20	4.35	4.13
Soil Conductivity (1:5 water dS/m)	0.079	0.055	0.065
Soil Conductivity (as EC_e dS/m) [note 10]	1.106	0.770	0.910
Native NaOH Phosphorus (mg/Kg P)	10	0	7
Residual phosphorus remaining in solution from the initial phosphate phosphorus			
Initial Phosphorus concentration (ppm P)	30	30	30
72 hour - 3 Day (ppm P)	12.81	17.48	7.72
120 hour - 5 Day (ppm P)	11.77	16.95	6.73
168 hour - 7 Day (ppm P)	11.21	15.81	6.39
Equilibrium Phosphorus (ppm P)	10.06	14.96	5.36
EXCHANGEABLE CATIONS			
Calcium ($cmol^+$/Kg)	6.17	3.00	5.50
Magnesium ($cmol^+$/Kg)	3.51	2.33	4.27
Potassium ($cmol^+$/Kg)	0.28	0.17	0.22
Sodium ($cmol^+$/Kg)	0.54	0.60	0.41
Aluminium ($cmol^+$/Kg)	1.40	0.61	2.30
Hydrogen ($cmol^+$/Kg)	0.60	0.38	0.94
ECEC (effective cation exchange capacity)($cmol^+$/Kg)	12.51	7.07	13.64
Exchangeable Calcium %	49.4	42.4	40.3
Exchangeable Magnesium %	28.1	32.9	31.3
Exchangeable Potassium %	2.2	2.4	1.6
Exchangeable Sodium % (ESP)	4.3	8.5	3.0
Exchangeable Aluminium %	11.2	8.6	16.9
Exchangeable Hydrogen %	4.8	5.3	6.9
Calcium/ Magnesium Ratio	1.76	1.29	1.29

Notes:
1: ECEC = Effective Cation Exchange Capacity = sum of the exchangeable Mg, Ca, Na, K, H and Al
2: Exchangeable bases determined using standard Gilman and Sumpter (1989) digest (Method 15E1) with no pretreatment for soluble salts. When Conductivity ≥0.25 dS/m soluble salts are removed (Method 15E2).
3. ppm = mg/Kg dried soil
4. Insitu P determined using 0.1M NaOH and shaking for 24 hrs before determining phosphate
5. Soils were crushed using a ceramic grinding head and mill; five 1g subsamples of each soil were used to which 40ml of 0.1M NaCl with Xppm phosphorus was added to each. The samples were shaken on an orbital shaker
6. Exchangeable sodium percentage (ESP) is calculated as sodium ($cmol^+$/Kg) divided by ECEC
7. All results as dry weight DW - soils were dried at 60C for 48hrs prior to crushing and analysis.
8. Phosphorus Capacity method from Ryden and Pratt, 1980.
9. Aluminium detection limit is 0.05 $cmol^+$/Kg; Hydrogen detection limit is 0.1 $cmol^+$/Kg. However for calculation purposes a value of 0 is used.
10. For conductivity 1 dS/m = 1 mS/cm = 1000 µS/cm; EC_e conversions: sand loam 14, loam 9.5; clay loam 8.6; heavy clay 5.8
11. 1 $cmol^+$/Kg = 1 meq/100g
12. Now changed to Australian Standard 1289.3.8.1-1997 but with using the SAR5 solution.

PHOSPHORUS SORPTION TRIAL (Page 1 of 1)

3 soil sample from Holmes and Holmes supplied on 5th December, 2008 - Lab Job No. A1309
Analysis requested by Matt. Your Reference:4320

Calculations for Equilibrium Absorption Maximum for Soil provided

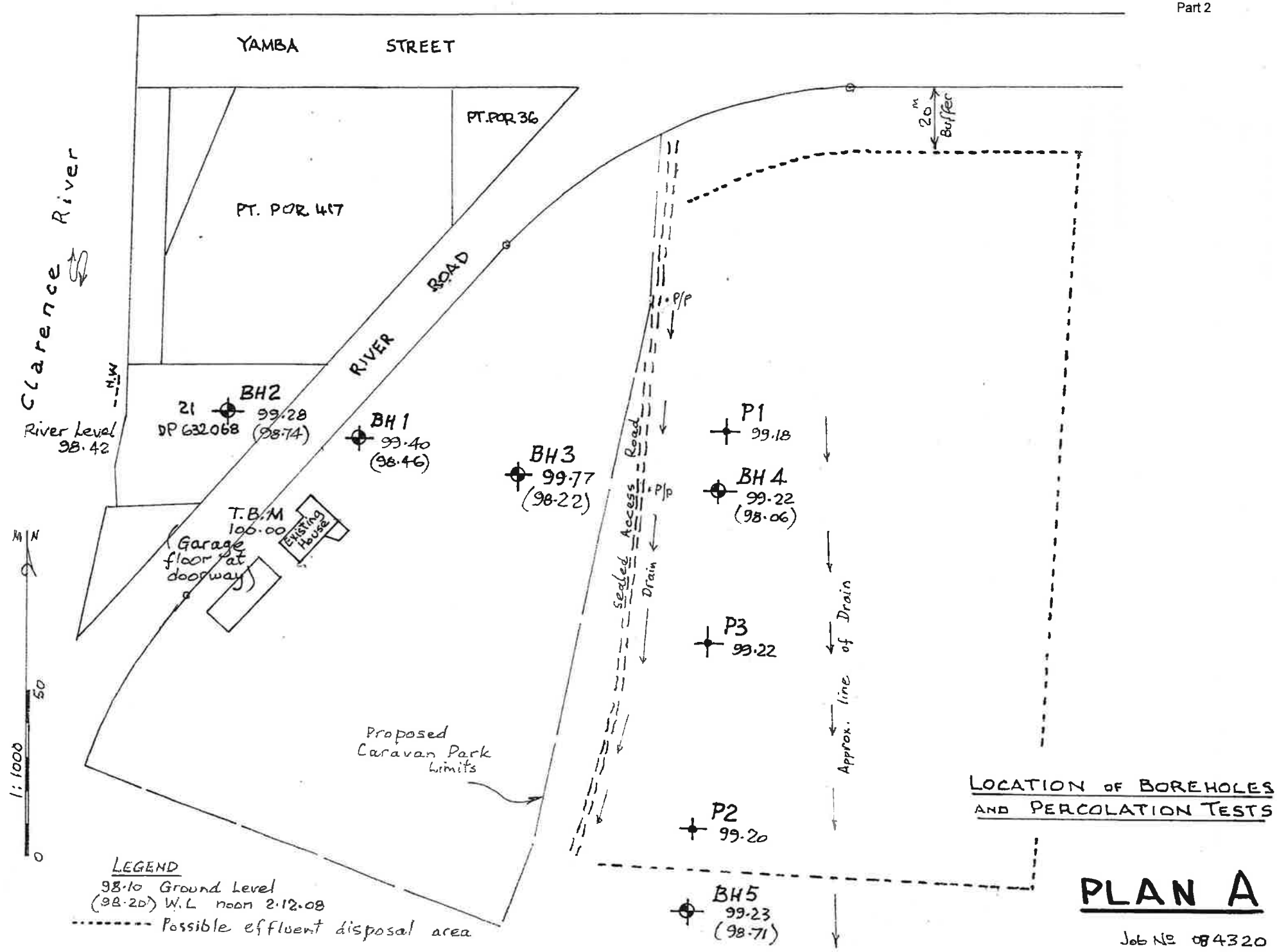
I.D.	JOB NO.	Equilibrium P mg P/L (in solution)	Added P mg P/L	P Sorb at Equil. mg P/Kg	Native P mg P/Kg	Equilibrium P Sorption Level µg P/g soil	Divide Ø (from Table)	Equilibrium Absorption Maximum (B) µg P/g soil
4320/1- 300-500	A1309/1	10.06	30	798	9.60	807	0.77	1,047
4320/2- 800-1000	A1309/2	14.96	30	602	0.00	602	0.84	718
4320/3- 200-450	A1309/3	5.36	30	986	6.80	993	0.68	1,470

Calculations for phosphorus sorption capacity

	JOB NO.	Equilibrium Absorption Maximum (B) µg P/g soil	multiply by theta of wastewater to be applied (=X)	minus the native P (=Y)	Kg P sorption / hectare (to a depth of 15cm) (1.95 is a correction factor for density, etc)	Kg P sorption / hectare (to a depth of 100cm) (1.95 is a correction factor for density, etc)
4320/1- 300-500	*A1309/1*	1047	(=B x theta)	(=X -native P)	(=Y x 1.95)	(=Y x 1.95 x 100/15)
4320/2- 800-1000	*A1309/2*	718	(=B x theta)	(=X - native P)	(=Y x 1.95)	(=Y x 1.95 x 100/15)
4320/3- 200-450	*A1309/3*	1470	(=B x theta)	(=X -native P)	(=Y x 1.95)	(=Y x 1.95 x 100/15)

EXAMPLE 1 - Calculations for phosphorus sorption capacity using a wastewater phosphorus of 15mg/L P

	JOB NO.	Equilibrium Absorption Maximum (B) µg P/g soil	multiply by theta of wastewater to be applied (ie. 0.84)	minus the native P (=Y)	Kg P sorption / hectare (to a depth of 15cm) (1.95 is a correction factor for density, etc)	Kg P sorption / hectare (to a depth of 100cm) (1.95 is a correction factor for density, etc)
4320/1- 300-500	*A1309/1*	1047	879	870	1,696	11,306
4320/2- 800-1000	*A1309/2*	718	603	603	1,175	7,837
4320/3- 200-450	*A1309/3*	1470	1235	1228	2,395	15,968


YAMBA STREET
PT.POR 36
PT. POR 417
Clarence River
River Level 98.42
N.W
RIVER ROAD
20m Buffer
BH2
21 DP 632068
99.28
(98.74)
BH1
99.40
(98.46)
BH3
99.77
(98.22)
T.B.M
100.00
EXISTING HOUSE
Garage floor at doorway
P1
99.18
BH4
99.22
(98.06)
P3
99.22
P2
99.20
BH5
99.23
(98.71)
Access Road
Sealed Drain
P/P
P/P
Approx. line of Drain
Proposed Caravan Park Limits
N
1:1000
50
0
LEGEND
98.10 Ground Level
(98.20) W.L noon 2.12.08
Possible effluent disposal area
LOCATION OF BOREHOLES AND PERCOLATION TESTS
PLAN A
Job No 084320

Annexure G
Flood Assessment

PRIDEL PTY LTD

FLOOD ASSESSMENT – 36 RIVER ROAD, PALMERS ISLAND

FINAL REPORT

May 2013

PRIDEL PTY LTD

FLOOD ASSESSMENT - 36 RIVER ROAD, PALMERS ISLAND

FINAL REPORT

May 2013

Prepared By:

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Version 3
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Job No.: 12-013

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Client:	Pridel Pty Ltd
Client Address:	C/- RDM Pty Ltd P O Box 4430 Coffs Harbour Jetty NSW 2450
Client Contact:	Mr Paul Reid

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TABLES

FIGURES

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1. INTRODUCTION

This report has been prepared by Paterson Consultants Pty Ltd for Pridel Pty Ltd, to support a Planning Proposal for a proposed caravan park development at Palmers Island, NSW.

The location of the caravan park proposed by Pridel Pty Ltd is shown on:

- Figure 1, which gives a district context;
- Figure 2, which gives an approximate development extent over an aerial photograph.

The proposed development is located beside the Clarence River and is sited on flood liable land.

In discussions between Clarence Valley Council and the project's consultant (RDM), Council has sought additional information regarding the flood liability of the site and flood emergency evacuation from the proposed caravan park.

It is noted that the only "fixed" buildings within the development will be a management building and an amenities block (Refer Figure 2).

2. FLOOD LIABILITY

Over the past 10 years, Clarence Valley Council has developed a two-dimensional hydraulic model of the Clarence River floodplain, which can be used to identify design flood levels at points distant from the major flood recording gauges.

Extracted design flood levels at the development site are given in Table 1 below. Table 1 also provides flood hazard in accordance with the NSW Floodplain Development Manual – Appendix L, Figure L2.

Ground levels across the site vary between RL 1.9 m AHD and RL 1.4 m AHD. The quoted ground levels are derived from recent Aerial Laser Survey (ALS) by NSW Land and Property Information (LPI).

Table 1

Design Flood Criteria, Palmers Island

Criteria	Western Boundary of Site (Clarence River Bank)	Eastern Boundary of Site
Design Flood Level (m AHD)		
Once in 100 year ARI	2.9	2.8
Once in 20 year ARI	2.46	2.37
Once in 5 year ARI	1.83	Not flooded

Criteria	Western Boundary of Site (Clarence River Bank)	Eastern Boundary of Site
Flood Hazard (Refer Figure L2 of Manual)		
Once in 100 year ARI	High	High
Once in 20 year ARI	Low/High Transition	Low/High Transition
Once in 5 year ARI	Not applicable	Not applicable

Comparison between the design flood levels for the 5 year ARI flood and ground levels (as defined by the ALS survey) along the Clarence River bank near the development site show ground levels above flood levels, while the design flood extents (as shown by Clarence Valley Council's TUFLOW model) show some spillage from the Clarence River immediately south of the proposed development site.

The reason for this discrepancy follows:

- the smoothing of the topography in the TUFLOW model into a 60 m grid;
- some likely error within the ALS data, which can be expected to be about 0.1 m or less on hard reflective surfaces.

On the basis of the above, it is expected that inundation of the development site can be expected with return periods between 5 and 10 year Average Recurrence Interval (ARI).

The flood flow velocity field over the development site is illustrated on Figure 3 (for the design 100 year ARI flood). The maximum flow velocities within the Clarence River channel are in the order of 1.5 m/sec, while over the development site, the peak flow velocities vary between 0.3 and 0.5 m/sec. Flow velocities on the floodplain of 0.3 m to 0.5 m/sec are not considered high or unusual.

On review, it is concluded that the proposed development will not have measurable impacts on the surrounding development, given:

- the separation of the development from existing surrounding developments;
- the relatively small flood flow velocities;
- the observation that the proposed development is sited within a large velocity field of similar magnitude;
- the only permanent structures will be the management building and the amenities block.

In this situation, further detailed hydraulic modeling is not considered warranted, as it is unlikely to change the conclusions above.

3. FLOOD EMERGENCY MANAGEMENT

The State Emergency Service (SES) has prepared the "Clarence Valley Local Flood Plan" (June 2012). The Local Flood Plan – Appendix F, details arrangements for evacuation of caravan parks and relocation of caravans.

Two caravan parks at Palmers Island are identified as:

- "Salt Water Big 4, Yamba Clarence Coast" sited at 286 O'Keefes Lane, Palmers Island; and
- "Fishing Haven Caravan Park", 35 River Road, Palmers Island.

The evacuation notes for the above caravan parks identify:

- "Access closes at 2.1 m on Yamba Road to Maclean";

- "Caravan Park is advised when Clarence River Flood Warning is issued, to allow visitors to evacuate before road closure commences".

The flood liability of the above two sites is the same as the proposed development site, and thus the same evacuation procedures should be applied.

The development site can expect to be inundated at about a once in 5 to 10 years Average Recurrence Interval (ARI) and as the flood magnitude increases, the flood hazard across the site will increase from "not inundated" to "high flood hazard".

Clearly, evacuation of the proposed caravan park and relocation of the caravans is the appropriate response.

With respect to evacuation and relocation of caravans, it is noted:

- retreat to the Pacific Highway along Yamba Road is the best option, given that the Pacific Highway thus provides linkage to Grafton and Ballina and other parts of the NSW road network;

- retreat to Yamba is not favourable as the evacuated persons and caravans are likely to be trapped at Yamba for several days, as road access will be cut;

- there is a reasonable co-relation between the recorded flood peaks at Grafton and Maclean, as illustrated by Figure 4. Figure 4 shows that the critical gauge height at Maclean for closure of the Yamba Road (2.1 m as per the Local Flood Plan) occurs when peak flood heights at Grafton are in the region of 5.2 m to 6.0 m.

- Figure 5 illustrates the time of travel for the flood peak from Grafton to Maclean, based on the Bureau of Meteorology records. Figure 5 shows that, for the flood heights of interest at Grafton (Gauge height 5.2 m to 6.0 m) times of travel are mainly in the range of 12 to 18 hours, but in some floods, the time of travel for the peak has been as low as 6 hours.

- The flood warning time available for flood heights above 5.0 m at Grafton is 6 to 12 hours.

Figure 6 shows the recorded flood hydrographs for the design 1% AEP flood and the January 2013 flood.

Figure 6 shows the design 1% AEP flood using a "spring tide" variation in ocean water levels and the addition of a once in 100 year ARI storm surge component.

Figure 7 shows the design 5% AEP and 20% AEP hydrographs plus the January 2013 event.

With respect to Figures 6 and 7, it is noted that:

- the design hydrographs are based on an inflow at Grafton which has been derived from historical events. Thus, actual floods, reaching a common peak gauge height at Grafton, may have total flood volumes which are greater or smaller than the design event.

- the time of travel of the flood peak from Grafton to Maclean is longer than the time of closure of Yamba Road at Gauge Height 2.1 m (at Maclean) from a point where the Grafton gauge heights are in the range of 5.2 m to 6.0 m;

- for design floods that peak at less than Gauge Height 6.0 m at Grafton, closure to Yamba Road can be expected about 6 hours after the flood height has reached 5.2 m at Grafton;

- during the January 2013 flood event, which rose sharply at Grafton, the time difference between reaching a height of 5.2 m at Grafton and the expected closure of Yamba Road (2.1 m at Maclean) was in the order of 6 hours.

Given the above, combination of the warning time available at Grafton and the time of travel from Grafton for the flood peak to close Yamba Road suggests that, once a predicted flood peak of Gauge Height 5 m is given at Grafton (midway between a "moderate" and "major" flood, 12 to 18 hours is available to evacuate the proposed development site.

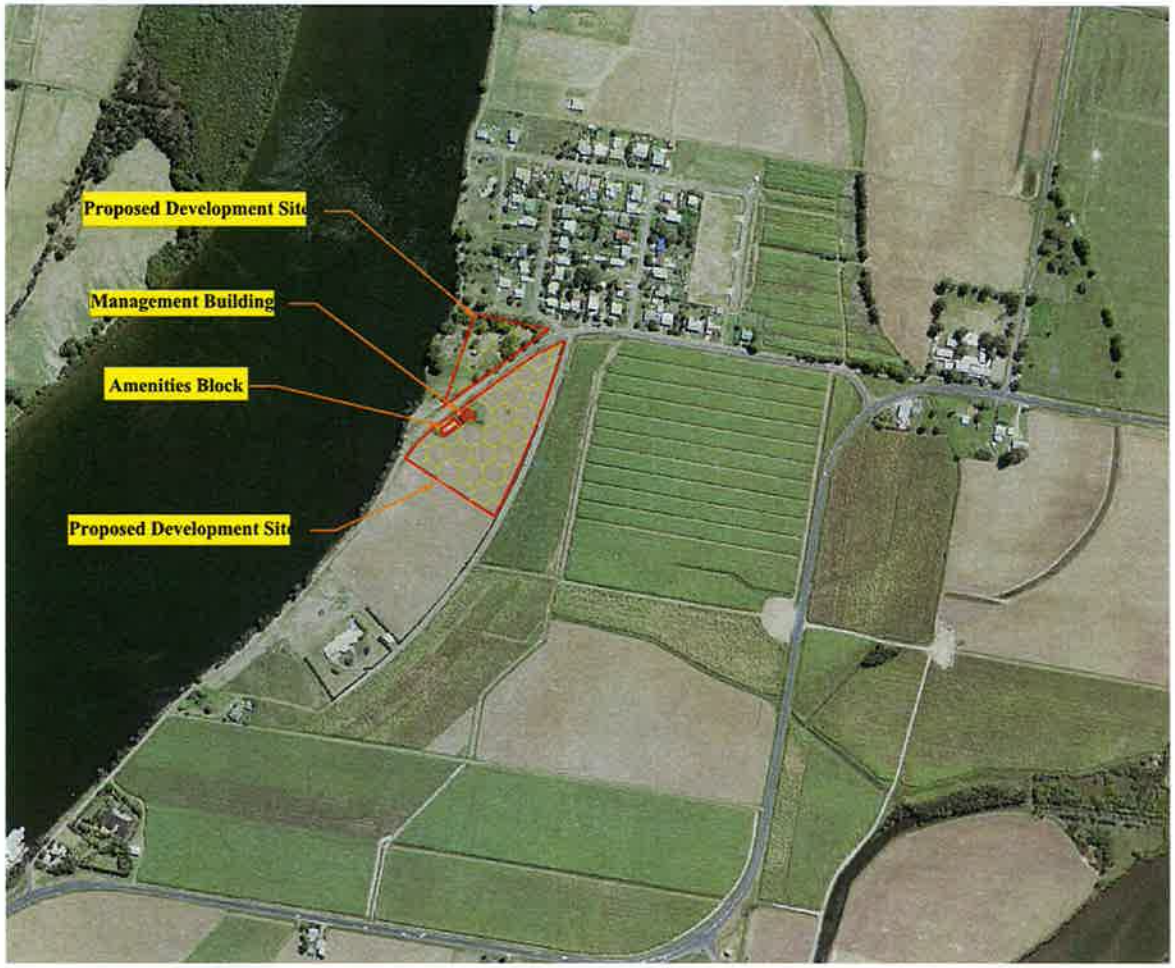
FIGURES

PRIDEL PTY LTD
PROPOSED CARAVAN PARK, PALMERS ISLAND
FLOOD BEHAVIOUR REVIEW

DATE: 9 APRIL 2013
DISK REF: 12-013
FILE REF: 12013_1_LOCALITY_PLAN_V1

FIGURE 1
LOCALITY PLAN

PRIDEL PTY LTD
PROPOSED CARAVAN PARK, PALMERS ISLAND
FLOOD BEHAVIOUR REVIEW



0 100 200 300 400 500
Metres

DATE: 9 APRIL 2013
DISK REF: 12-013
FILE REF: 12013_2_DEVELOPMENT SITE_V1

FIGURE 2
DEVELOPMENT SITE

PRIDEL PTY LTD
PROPOSED CARAVAN PARK, PALMERS ISLAND
FLOOD BEHAVIOUR REVIEW

0 100 200 300 400 500
Metres

Velocity Arrow Scaling
1.0 m/s

DATE: 11 APRIL 2013
DISK REF: 12-013
FILE REF: 12013_3_Flood_Flow_Velocities_V1

FIGURE 3
FLOOD FLOW VELOCITIES
(DESIGN 100 YEAR ARI EVENT)

PRIDEL PTY LTD
PROPOSED CARAVAN PARK, PALMERS ISLAND
FLOOD BEHAVIOUR REVIEW

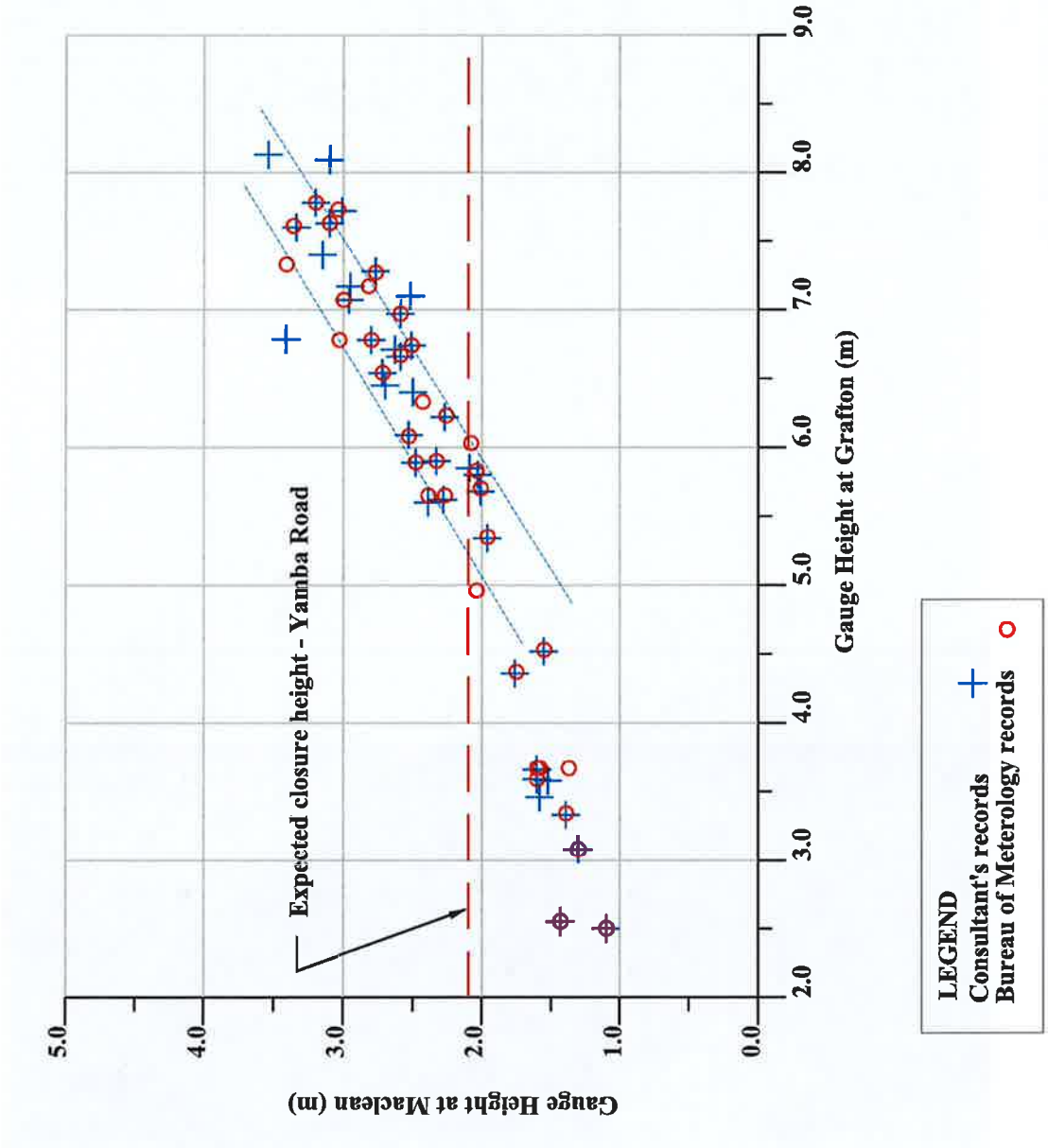
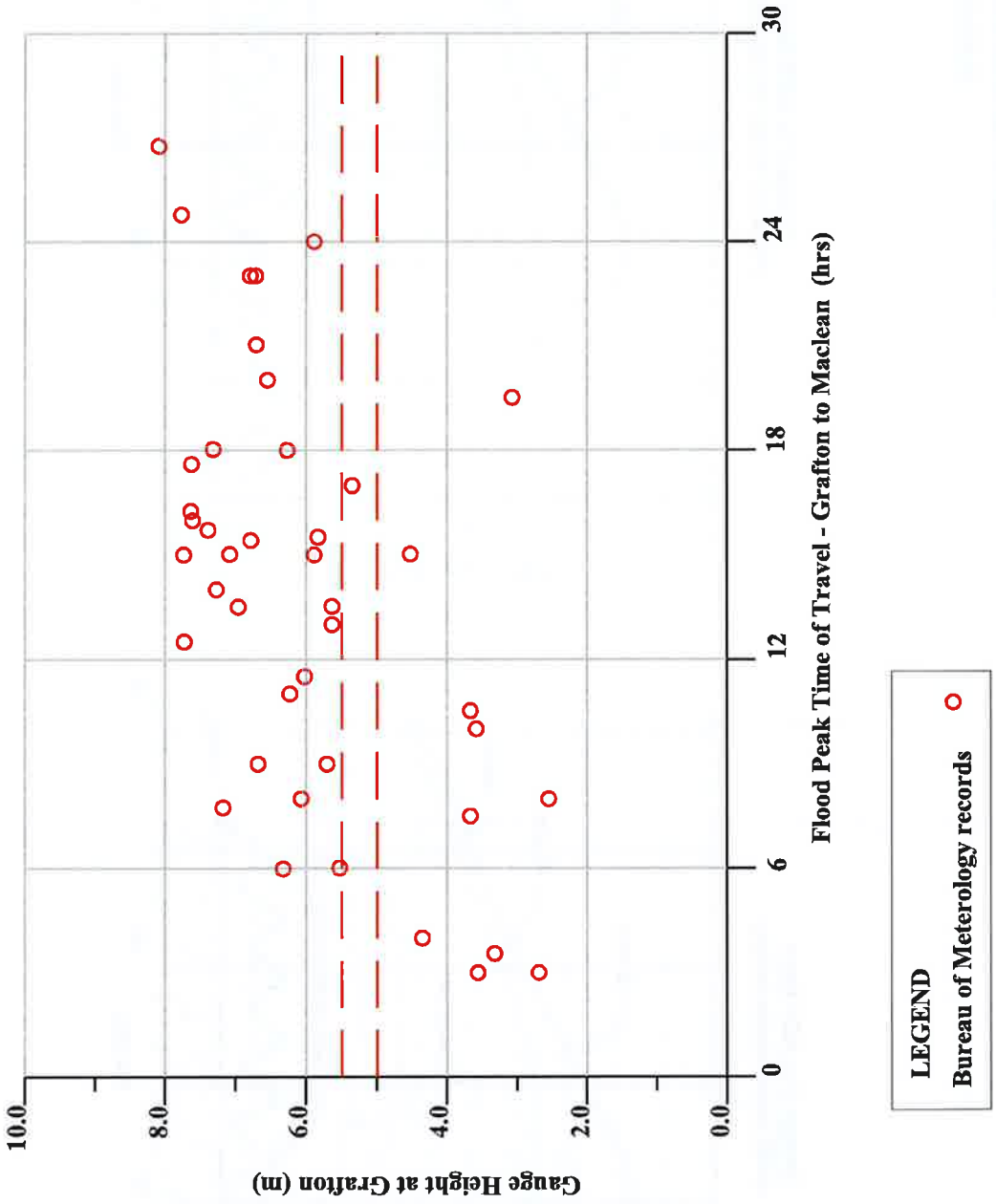


FIGURE 4
CO-RELATION GRAFTON TO MACLEAN

DATE: 9 APRIL 2013
DISK REF: 12-013
FILE REF: 12013_4_Co-relation_Grafton to Maclean_V2

PRIDEL PTY LTD
PROPOSED CARAVAN PARK, PALMERS ISLAND
FLOOD BEHAVIOUR REVIEW

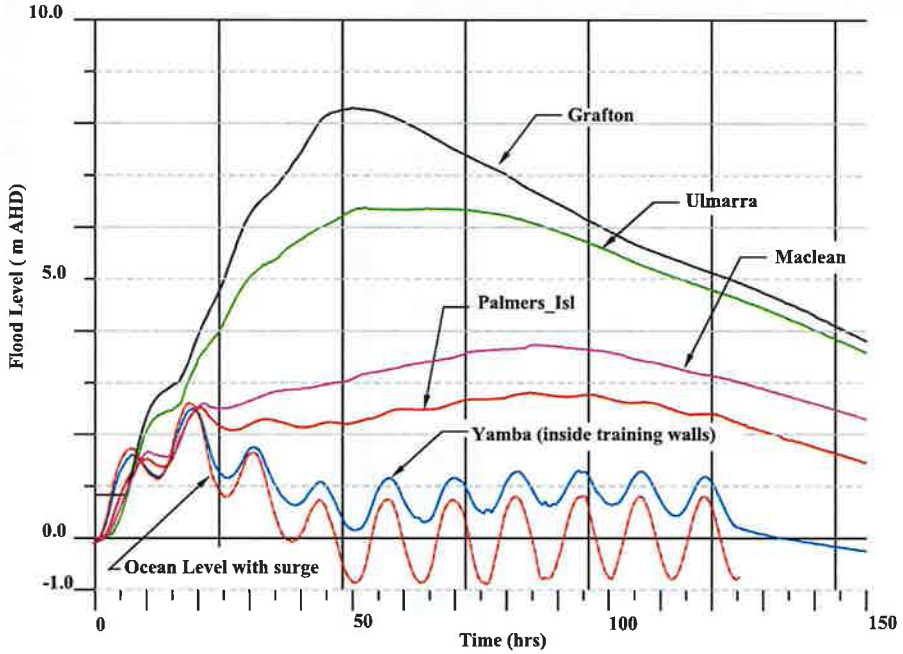


DATE: 9 APRIL 2013
DISK REF: 12-013
FILE REF: 12013_5_TIME_OF_TRAVEL_Grafton to Maclean_V1

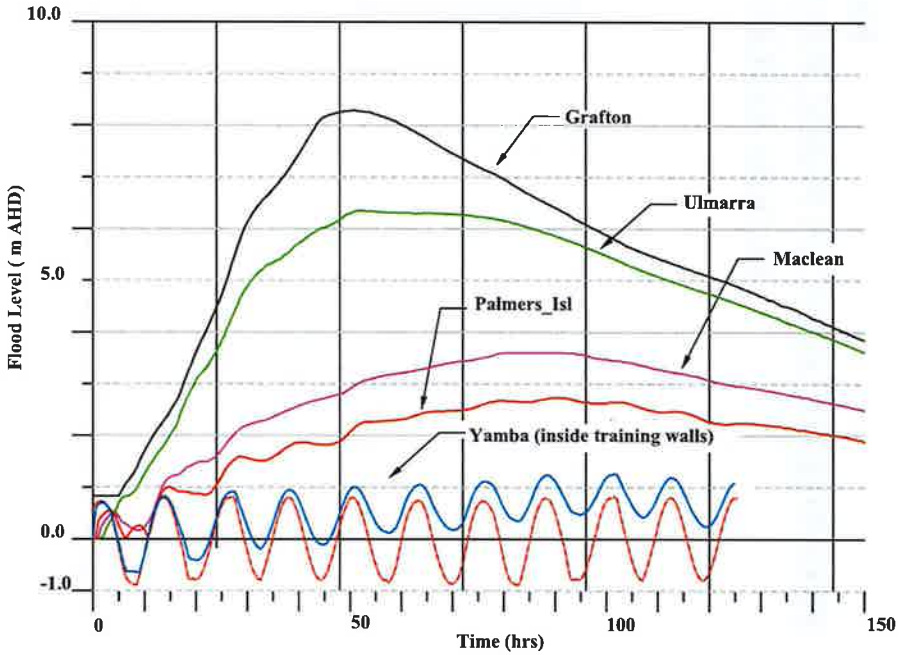
FIGURE 5
FLOOD PEAK TIME OF TRAVEL

PRIDEL PTY LTD
PROPOSED CARAVAN PARK, PALMERS ISLAND
FLOOD BEHAVIOUR REVIEW

Design 1% AEP flood
(with ocean storm surge)



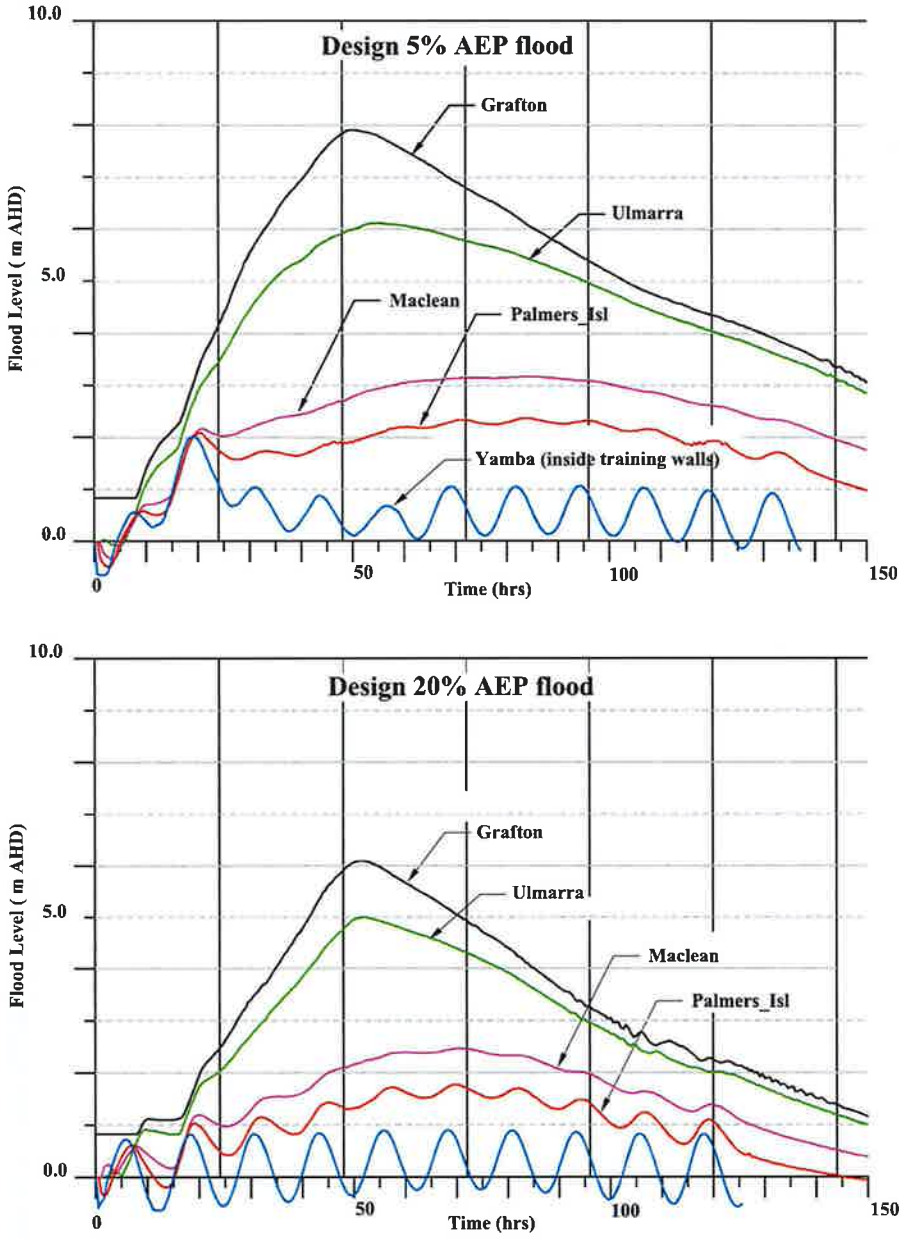
Design 1% AEP flood
(without ocean storm surge)

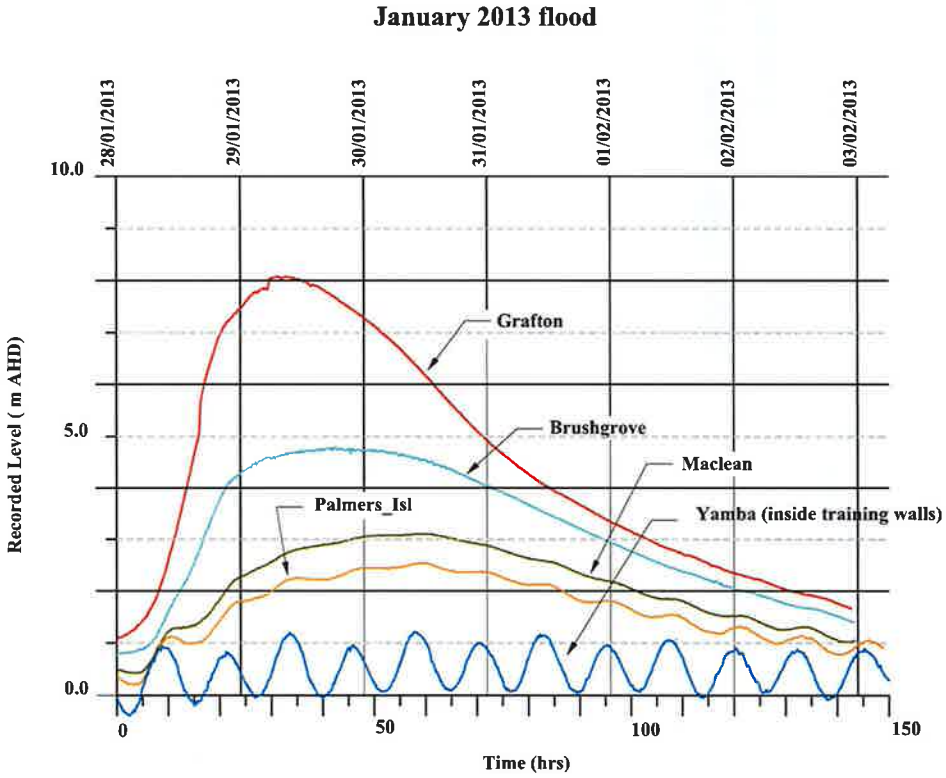


DATE:19 APRIL 2010
DISK REF: 12-013
FILE REF: 12013_6_DESIGN_1%AEP_HYDROGRAPHS_V1

FIGURE 6
DESIGN 1%AEP HYDROGRAPHS

PRIDEL PTY LTD
PROPOSED CARAVAN PARK, PALMERS ISLAND
FLOOD BEHAVIOUR REVIEW





DATE:19 APRIL 2010
DISK REF: 12-013
FILE REF: 12013_7_FLOOD_HYDROGRAPHS_V1

FIGURE 7
FLOOD HYDROGRAPHS

Annexure H
Correspondence from the NSW Sugar Milling Co-Operative Limited

NEW SOUTH WALES SUGAR MILLING CO-OPERATIVE LIMITED

HARWOOD MILL * HARWOOD ISLAND NSW 2465, AUSTRALIA
TELEPHONE: 02 66400 400 * FAX: 02 66464 550
EMAIL: harwood@nswsugar.com.au

Sunshine Sugar

20th March 2012

To Whom It May Concern:

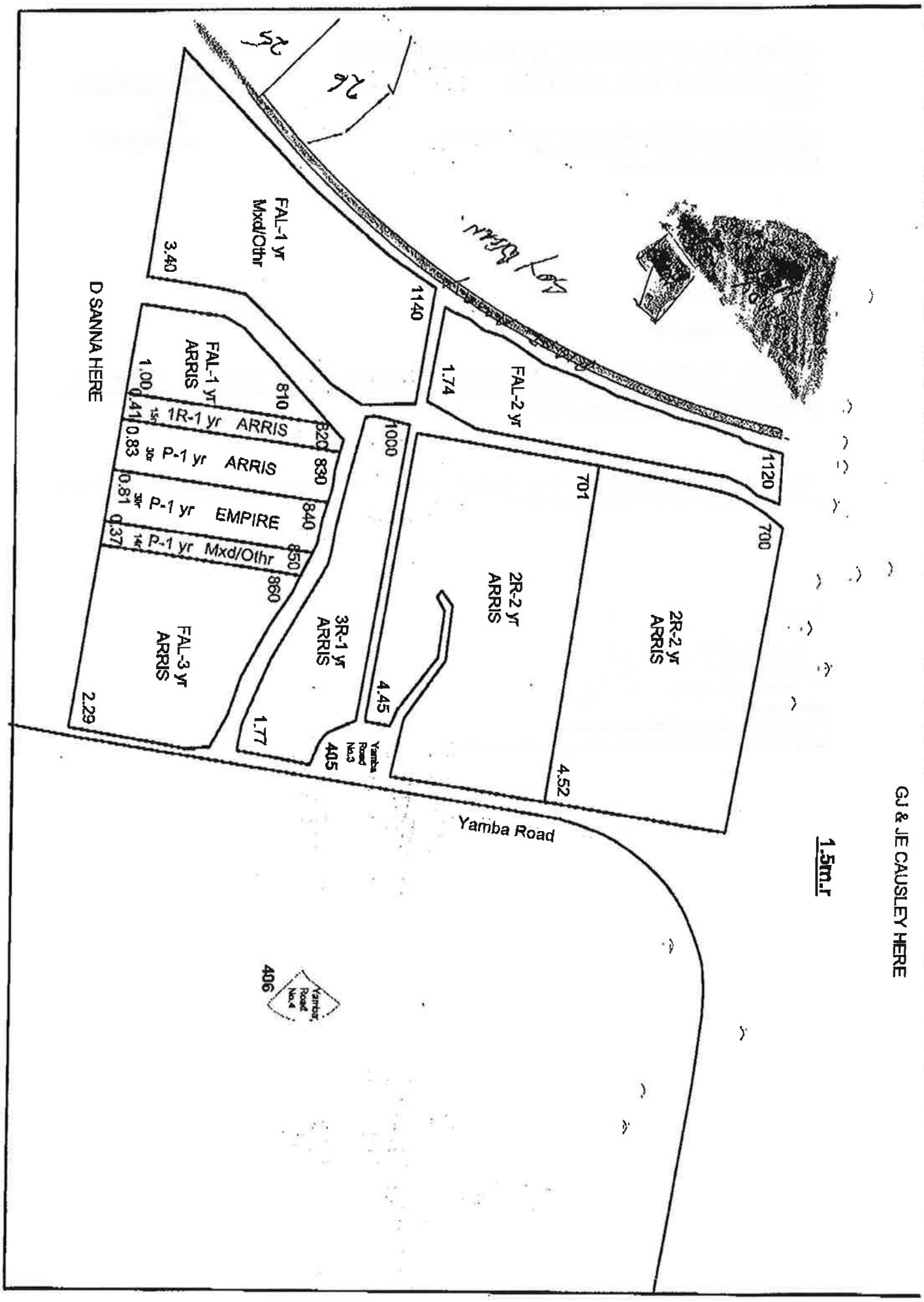
Subject: PRIDEL P/L

This grower has Production Area Entitlement of 47.3 hectares, which is allocated to grow on Lot 3 DP1008054 and Part Lot 27 DP1130643, excluding land west of right of access to lots 25 & 26 adjacent to the river, Parish Taloumbi, County Clarence.

This is to confirm that all arable land belonging to PRIDEL P/L, within the above description, is dedicated to the long-term cultivation of sugar cane crops.

Sincerely,

Simon Hollis
Cane Supply Superintendent Harwood
New South Wales Sugar Milling Co-operative Limited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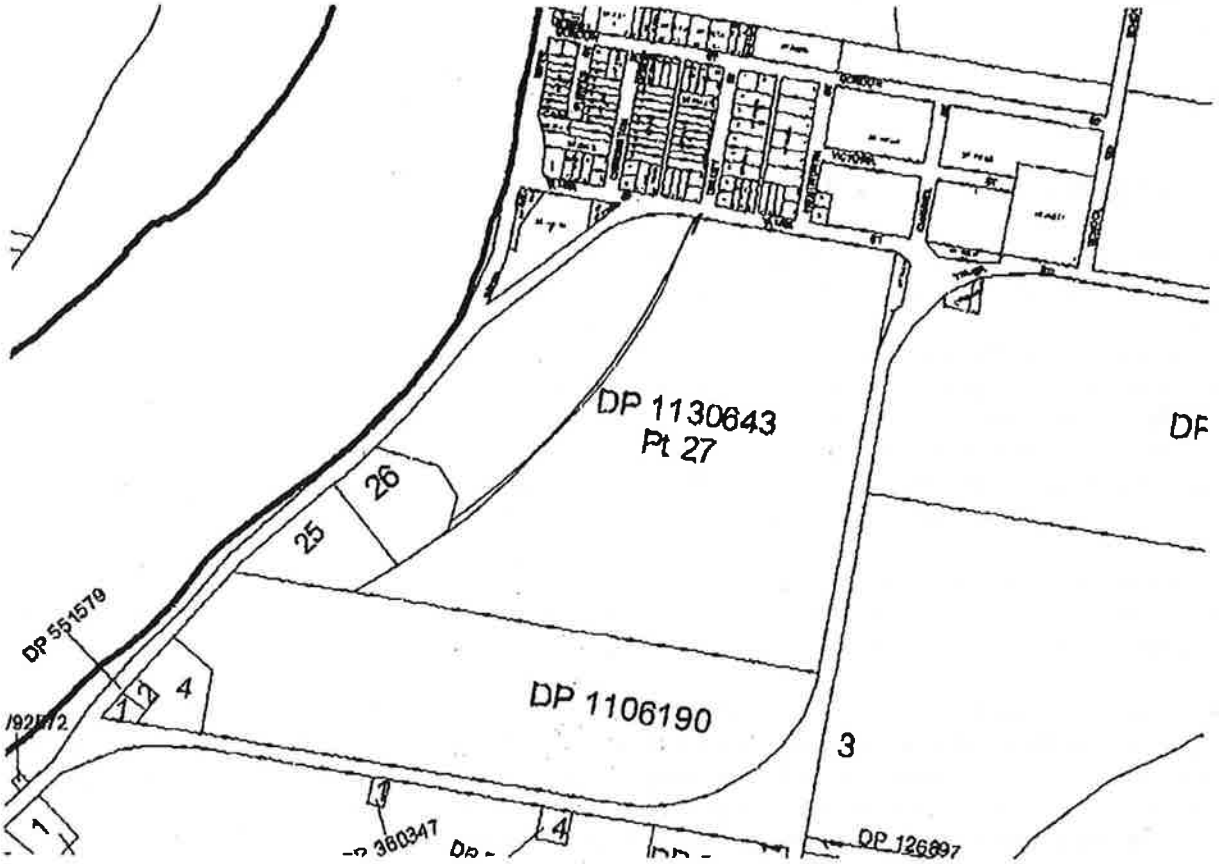
Mxd/Othr
3.40
1140
FAL-2 yr
1.74
1120
D SANNA HERE
FAL-1 yr
ARRIS
1.00
810
1R-1 yr ARRIS
0.41
15yr
820
P-1 yr ARRIS
0.83
30yr
830
P-1 yr EMPIRE
0.81
30yr
840
P-1 yr Mxd/Othr
0.37
14yr
850
860
1000
701
700
2R-2 yr
ARRIS
2R-2 yr
ARRIS
FAL-3 yr
ARRIS
2.29
3R-1 yr
ARRIS
1.77
4.45
4.52
Yamba Road No.3
405
Yamba Road
406
Yamba Road No.4
1.5m.r
GJ & JE CAUSLEY HERE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