



AITKEN ROWE TESTING LABORATORIES PTY LTD

REVIEW OF LAND CAPABILITY & SALINITY STUDIES

NORGRIFF PTY LTD

LAKESIDE ESTATE, LAKE WYANGAN, NSW

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1. Introduction and Project Understanding

Aitken Rowe Testing Laboratories Pty Ltd (ARTL) were commissioned by Norgriff Pty Ltd to undertake a review of land capability and salinity studies prepared for the original Pelican Shores Estate development. The parcel of land at Lake Wyangan subject to this review is Lot 253 in DP 1119328 (the Site) and comprises approximately 50Ha. It is understood that comprehensive Environmental Impact Studies have been prepared circa 2000 for the Pelican Shores Estate which comprised an 88 Lot peri-urban subdivision. The development of Pelican Shores has been partially completed with 2 stages (21 Lots total) subdivided and sold. The original Pelican Shores Estate development proposal included the need for on-site treated effluent disposal. The Site now has reticulated sewer available which has resulted in the development plan being revisited.

The current Site owner is proposing to prepare a new development application for what will be known as Lakeside Estate. It is the purpose of this report to review the following documents and comment on their relevance to the Salt Action: The Salinity Control Strategy for New South Wales;

- Land Capability Study – Proposed Rural Residential Subdivision – ARTL December 1999.
- Hydrological Study – Pelican Shores – Lisa Short March 2000.
- Electro-magnetic Survey – Pelican Shores – CSU.
- Building Construction Recommendations – Pelican Shores – Kendall & Sellick July 2000.
- Salinity Report – Pelican Shores Development – ERIC August 2000

It is understood that the above reports were used to complete the Environmental Impact Statement for Pelican Shores which was completed by Osburn Consulting in August 2000.

2. Site Description

The Site is located within the locality of Lake Wyangan approximately 5km north of the central business district of Griffith (Figure 1). The site is bound by Jones Road to the north, Lake Wyangan South to the west, vacant land to the south and South Lake Drive to the east. Campbell's Swamp lies further north. The 2 swamps are connected via open drainage and an existing culvert on Jones Road. The low lying area in the north west corner of the Site is known as Little Swamp. Little Swamp is connected to Lake Wyangan South via open drainage channel that runs predominantly east-west from the south western corner of Little Swamp (Appendix A).

A detailed Site inspection was undertaken by ARTL representative in August 2016. The Site was noted to be predominantly undeveloped with groundcover ranging from exposed soil to thick grasses/weed vegetation. The Site is generally undulating with a lower area toward the north west corner (Little Swamp). There were isolated areas of what appeared to be saline effected soil noted. These areas were found on the access track immediately south of Little Swamp and in the southern mid section of the Site. These areas are consistent with the EM survey maps previously undertaken. A Site plan and photographs are attached in Appendix A.

3. Report Review

3.1 Land Capability Study – Proposed Rural Residential Subdivision – ARTL December 1999.

The land capability study performed by ARTL (1999) included the excavation of 11 boreholes to 2.0m and 15 to 0.2m across the Site. The boreholes were logged and samples were taken at various depths for analysis of chloride and sulphate as well as pesticide contamination (organophosphorus and organochlorine pesticides).

ARTL (1999) concludes that the site was clean with respect to pesticide contamination. The 1999 report continues stating that 2 areas were noted as having a salinity problem at the surface with obvious destruction of grassland and vegetation. Further the salinity results are quite high in 4 boreholes based on the EC1:5 values.

3.2 Hydrological Study – Pelican Shores – Lisa Short 2000.

The hydrological study completed for the Site calculated that the groundwater flows from the east into Lake Wyangan. Lateral flows of groundwater into the lake are slow. Lake Wyangan is identified as a natural groundwater sink. Groundwater levels have been relatively stable in the previous 5 years (ie 1995 to 2000). Sulphates present in the soil do not pose a threat unless groundwater reaches foundations or underground services. The natural drainage patterns through the development site have been modified but were preserved in the planned development through use of open space areas. It is noted that revegetation with native species was also proposed for recharge areas.

3.3 Electro-magnetic Survey – Pelican Shores - CSU.

The electromagnetic survey completed by the Farrer Centre of Charles Sturt University was conducted to provide an indication of variability of soil conductivity. As recommended in the CSU report the survey requires correlation with soil type to determine the physical and chemical characteristics of the surveyed area.

3.4 Building Construction Recommendations – Pelican Shores – Kendall and Sellick – July 2000.

Kendall and Sellick provide the following recommendations for building in a saline environment. The recommendations are based on compliance with AS2870 – Residential Slabs and Footings.

- Vibrate all concrete and cure for 3 days
- Use damp proof membranes as opposed to vapour barrier.
- Design and construct drainage to avoid water ponding against or near the footing
- Carefully detail and place all damp proof coursing. Use damp proof course not subject to corrosion.
- Consider extension of damp proof course to the cavity flashing.
- Ensure minimum 50mm cover on all concrete.
- Use non-corrosive in ground service pipes ie uPVC or similar.
- Use only exposure grade bricks.
- Select low water use lawn and ground cover.
- Consider the use of 40MPa concrete.

It should be noted that although the standards cited in the above recommendations have been amended since 2000 they predominantly remain the same with respect to potentially aggressive soils.

3.5 Salinity Report – Pelican Shores Development – ERIC August 2000.

The Salinity Report completed by Environmental Research & Information Consortium (ERIC) is a comprehensive compilation and interpretation of the reports outlined above and those that have been made redundant due to the change in proposal (water balance analysis for disposal of waste water for example). ERIC uses the data collected from the boreholes (ARTL 1999) and correlates this to the electro-magnetic survey completed by CSU. Along with the hydrological data (Lisa Short 2000) the ERIC report identifies there is a salinity issue at the site. The areas of high salinity were noted to be in the north west corner of the Site associated with the area known as Little Swamp and the north eastern corner of the site adjacent to the intersection of Boorga and Jones Roads.

The salinity levels are due to the occurrence of calcium salts opposed to sodium. This significantly reduces the adverse effects of salinity on plants therefore allowing for the development of woody and non-woody vegetation easily. The ERIC report continues by stating that woody vegetation can draw water from deeper in the profile than most grasses which helps leech salt deeper into the soil profile hence improving conditions at the surface.

The ERIC report continues by identifying six locations where depth to groundwater was 2m or less along the western and southern boundaries of the Site. It is further detailed that these levels all occurred in the low lying areas of the Site.

The Salinity Report goes into detail for proposed earthworks, vegetation establishment and ongoing monitoring of soils and groundwater. It then concludes that;

- The existing salinity identified does not prevent any aspect of the proposed development.
- The development design takes salinity into account and should provide on and off site improvements.
- Measures can be implemented to reduce occurrences of high surface soil salinity arising from prior land use.

4. Compliance with The Salt Action: The Salinity Control Strategy for NSW

The salt action task force was developed to promote and evaluate salt action on a state wide basis. This is achieved through Salt Action Plans developed by individuals and community groups through to regional and catchment management committees. The Salinity Control Strategy aimed to coordinate and assist local groups in undertaking salinity control strategies. The activities for local salt action plans are the most applicable for The Lakeside Estate subdivision;

- Local Planning – from the previous studies outlined above the Lake Wyangan catchment has been identified as having a salinity problem. The master plan to be developed by Land Urban will incorporate salinity strategies as required.
- Control Measures – there is a comprehensive list of mitigation measures provided in the above reports. These will need to be updated to ensure compliance with current standards (AS 2870 for example). The original Pelican Shores allowed for a minimum 50% of land to be revegetated. It is understood the Lakeside Estate will increase this to

- 60%. Further the low lying areas have been identified as open space for further high density revegetation which will avoid development in high risk areas.
- Community Awareness – This will be achieved throughout the planning and construction phases of Lakeside Estate. The estate has the potential of being a significant success of developing and improving salinity effected area and should therefore be heavily promoted as such.
 - Monitoring – There are 6 x piezometers installed at the site which will be used to regularly monitor ground water levels and chemical composition.
 - Evaluation – It is the purpose of this review to evaluate comprehensive studies previously undertaken. Further the development application process will ensure stringent review of planning proposals (construction through to ongoing maintenance and monitoring) for the subdivision.
 - Research – A significant amount of research has already been completed at the site. Geotechnical Investigations will be required for each lot prior to residential development. It is recommended to include analysis of pH, EC, Chlorides, Sulphates and resistivity as part of the geotechnical investigations, particularly for those lots within the identified higher risk areas. This will add to the data set.
 - Extension – The integration of numerous mitigation measures within the proposed development will ensure demonstration of rehabilitation and preventative techniques.

The previous studies completed for the Pelican Shores Development show compliance with the Salt Action; Salinity Control Strategy for NSW.

5. Recommendations

In respect to those areas that are identified in the Salinity Mapping (ERIC Aug 2000) as having elevated soil salinity or water tables the following ameliorating actions are proposed;

- Little Swamp (north west corner of the Site) – Excluded from the developable area and set aside as open space. Largely undisturbed and revegetated with woody perennial vegetation to reduce soil surface salinity and promote the growth of grasses.
- Jones Road Culvert (North East) – ameliorate by providing a positive drainage path to Little Swamp to limit surface water accessions to groundwater.
- Adjacent Jones Road Culvert (to Campbell's Swamp) – ameliorate by filling with low salinity soil & topsoil to promote vegetative growth & drainage to limit surface water accessions to groundwater.
- Areas along the Western and Southern Boundary – subject to high water tables. The depth to water table is controlled by regional groundwater gradients to Lake Wyangan. Site filling to RL 108.00 using low salinity soil from the elevated section of the site will increase the depth to the water table to over 2 metres. An increase in depth of fill and permeable surface soil will promote the growth of vegetation and reduce the chance of adverse salinity effects.

The NSW Office of Environment and Heritage (NSW OEH) have further developed Salinity Control Strategies and includes The Local Government Salinity Initiative (LGSI). The LGSI provides training, education and technical support to local government on urban salinity issues. As a part of the LGSI, a series of booklets have been produced to address urban salinity. The following publications (as a minimum) should be reviewed as part of the planning process for Lakeside Estate;

- Site Investigations for Urban Salinity
- Roads and Salinity
- Building in a Saline Environment
- Water wise Parks and Gardens

The NSW OEH identifies a number of management strategies that should be applied (most of which have already been identified in the previous reports for the Site). These include:

- Avoiding over-watering public parks, sports fields, home gardens and lawns
- Planting large native trees and shrubs in open spaces
- Investigating the extent of leaking channels and pipes and implementing a pipe replacement program using corrosion resistant materials
- Assessing the likelihood that current and proposed water storages, artificial lakes and drainage basins contribute to groundwater recharge, with strategies to minimise where possible
- Ensuring that water drains away from infrastructure developments to avoid ponding
- Monitoring changes to water table levels and groundwater quality by installing piezometer ('monitoring bore') networks, and
- Encouraging residents to establish gardens with low water requirements.

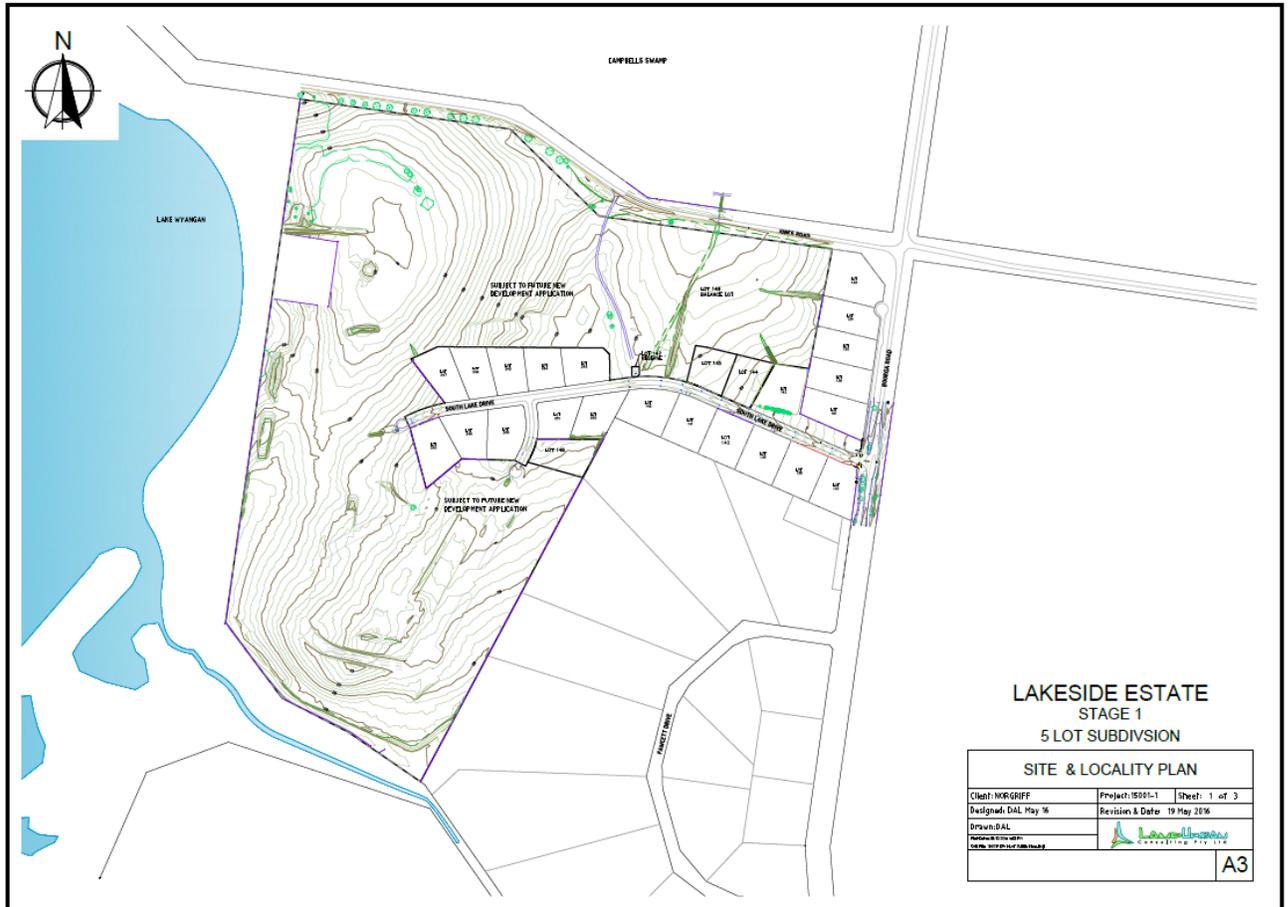
6. Conclusions

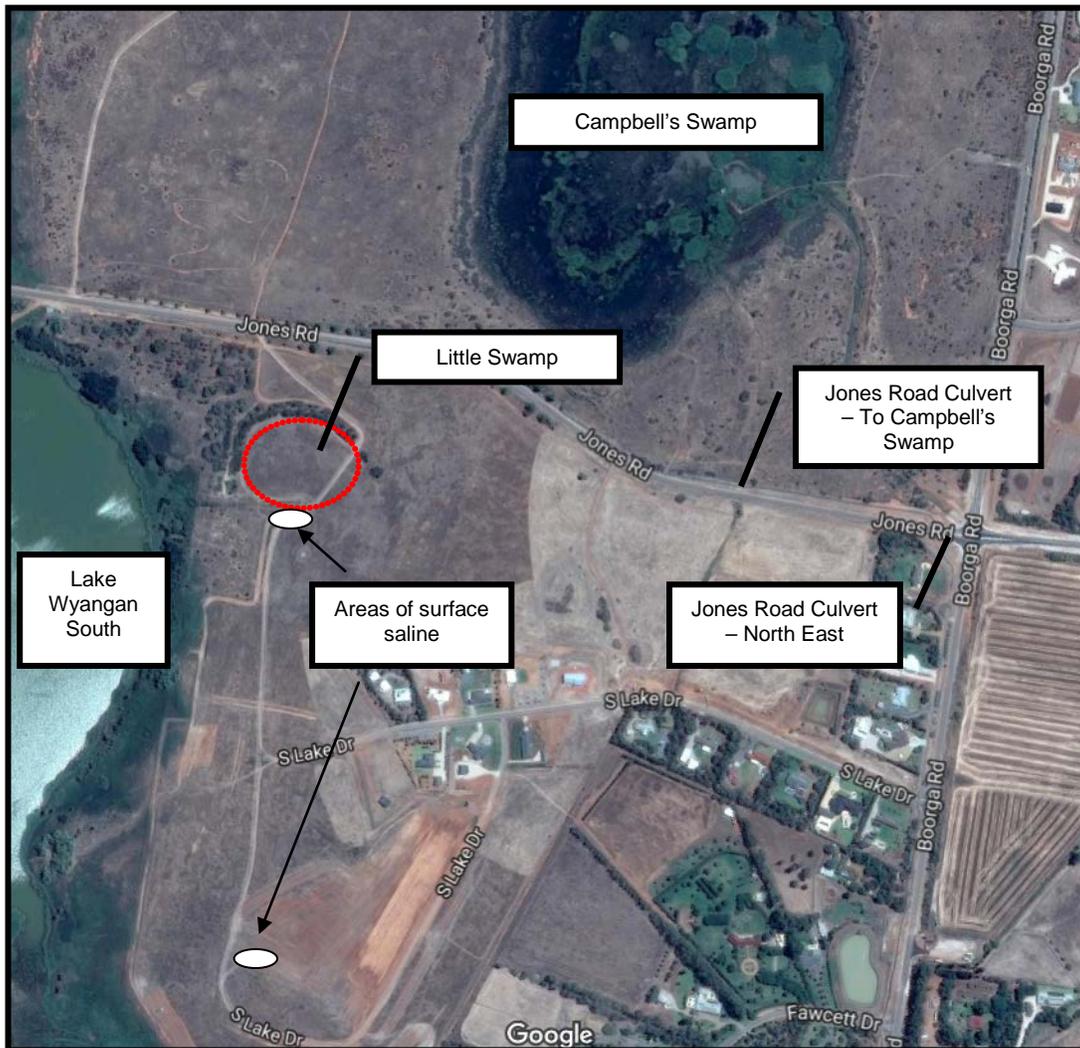
The previous reports completed for the Pelican Shores Estate development are comprehensive in identifying issues relating to salinity. There are a number of planning strategies that when implemented will ensure mitigation of the identified issues. There are some changes to the various standards from 2000 to now. These can, however be easily addressed using the original data.

The contamination assessment completed targeted pesticides which given the previous land-use as agriculture is acceptable. The number of sampling points does not meet the minimum required for the area of land being investigated (per AS 4428.1). However given that all samples analysed did not register above the laboratory limits the risk associated with widespread significant pesticide contamination is considered extremely low to non-existent.



APPENDIX A
SITE PLANS AND PHOTOGRAPHS







Photograph taken from Jones Road looking south west across the Site.



Photograph displaying the lower lying area to the north west of the Site.



Photograph displaying area affected with surface salinity.



Photograph taken from the western boundary looking east across the Site.