Environmental Standards Applying to Liner Construction **March 2006**

Environment Division has now developed a protocol for ensuring that lagoon liners meet environmental protection standards.

All Sewage Lagoon Liners

- Must be competently designed and installed by suitably qualified engineering personnel
- All compacted clay liner (CCL) material testing should be carried out according to AS1289.5.1.1 or AS1289.5.2.1
- CCL must be protected from drying out or surface hardening if required during installation
- CCL must have in-situ permeability testing undertaken to verify permeability performance
- Liner systems using geomembranes (GM) or geosynthetic clay liners (GCL) must be installed with manufacturers guarantee
- GM or GCL without manufacturers guarantee must have in-situ permeability testing to verify the quality of the liner
- All earthworks and construction must meet the requirements of AS3798
- Appropriate stormwater and weed controls must be in place during construction
- The certified engineer in charge of works shall be responsible for:
    - ⇒ supervising liner installation and quality control
    - ⇒ supervising all technical staff involved
    - ⇒ properly conducting quality control tests and sampling in the field
    - ⇒ "signing off" all quality control testing
    - ⇒ completing documentation of all relevant activities including engineering design, construction and quality assurance activities
- Lagoon wastewater constituents from any trade wastes or any other constituents of the wastewater stream must be checked for liner compatibility, and risk of migration to ground water

Preferred Approach: Performance Based Liner Design

- There must be good reasons for not adopting a performance based approach. If it can not be adopted in its entirety, as much of the performance based approach is to be used as possible.
- Full Geotechnical/Geological investigation to AS 1726 for likely seepage affected area to identify:
    - ⇒ quality of ground water,
    - ⇒ potential effects of contamination from lagoon effluent (nitrates, heavy metals etc),
    - ⇒ any corrosive effects or potential for liner damage,
    - ⇒ direction of pore pressure, and
    - ⇒ flow patterns and recharge effects on/of groundwater.
    - ⇒ potential problems such as saline subsoils, aquifer recharge zones, local bores etc
- The final design recommends a liner system that
    - ⇒ achieves an ecologically sustainable flow rate for limiting contaminant movement (most likely nitrates) into groundwater.

⇒ achieves a permeability rate that, depending on local groundwater quality, geology etc., best protects the groundwater system for future use.

Second Best Approach: Minimum Standard Based

- If a performance based approach is not adopted, there must be good reasons for not adopting a minimum standard based approach. If it can not be adopted in its entirety, as much of the minimum standard approach should be used as possible.
- This approach is not suitable for complex groundwater zones such as recharge/discharge areas
- Minimum depth to groundwater (from bottom of lagoon) must be 2 metres
- Only undertake clay lining with appropriate selected clay
- Liner thickness requirements – lagoon bottom 400mm, lagoon walls 600mm (with further wave wall treatment required to prevent erosion)
- Maximum in-situ permeability is 10^{-9} m/sec (10^{-7} cm/s) throughout the full depth of the liner. In-situ testing for verification should be carried out to AS1289
- Synthetic liners with equivalent or lower permeability can also be installed where feasible.

Least Favoured Approach: Net Best Environmental Outcome

- If for some reasons the minimum standards cannot be met then due consideration must be given to demonstrating the need for the new lagoon. This need for constructing the lagoon must be described along with the potential environmental benefits of installing the lagoon. The positive environmental benefits must outweigh the disadvantages and the risks posed to local groundwater and/or surface waters.
- Only for use in low risk groundwater areas.