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# Factsheet

## Pond Freeboard

### Summary

Freeboard is defined as the vertical height between the crest of the holding pond wall and maximum designed water level. Several guidelines specify minimum standards of freeboard height but these vary across industries.

The intent of this document is to outline DPIRD's position on pond freeboard height requirements, regardless of industry or application, using a risk-based approach.

Height requirements presented in this document only apply to ponds that have considered the following in design:

1. Overflow point at the top of the freeboard
2. Capacity to contain storm/wet season inflow in the maximum designed water level for the chosen Average Recurrence Interval (ARI)
3. Safety factors for any other environmental conditions effecting either evaporation area or pond volume, e.g. debris on surface, shade from surrounding structures/trees and volume loss due to solids build-up.

Ponds designed using 'Factsheet: Evaporation Pond Design' already have these design considerations taken into account.

### Department Position

The maximum designed water level of a pond should capture all design criteria outside of wave action. Excessive wave action can detrimentally affect the structural integrity of pond infrastructure and can cause pond collapse and failure. Freeboard is a safety mechanism that provides an element of protection from wave action, and is an additional height above the designed maximum pond water level. Therefore, freeboard height requirements should be based on wave action from strong winds.

Table 1 outlines the recommended freeboard heights based on maximum wave heights formed across a water surface during strong wind. Pond size refers to the longest distance across the water surface of the pond.

Pond Size	Recommended Freeboard
Small (Length < 100 m)	100 mm
Medium (Length 100 - 500 m)	200 mm
Large (Length 500 - 3000 m)	300 mm
Extra Large (Length > 3000 m)	Modelling Recommended

Table 1 – Recommended freeboard height.

## Rationale

Wave action across a holding/evaporation pond is dependent on the maximum distance across the water surface. Four pond sizes (Small, Medium, Large and Extra Large) are used to summarise the recommended freeboard height. Freeboard heights for various pond sizes are based on calculated wave height formation for shallow (1.5 m) ponds during strong winds, details shown in Figure 1.

A 'trough-peak' wave height is double the 'average water level-peak' wave height. Figure 1 shows wave heights relative to the average water level, or half the trough-peak height.

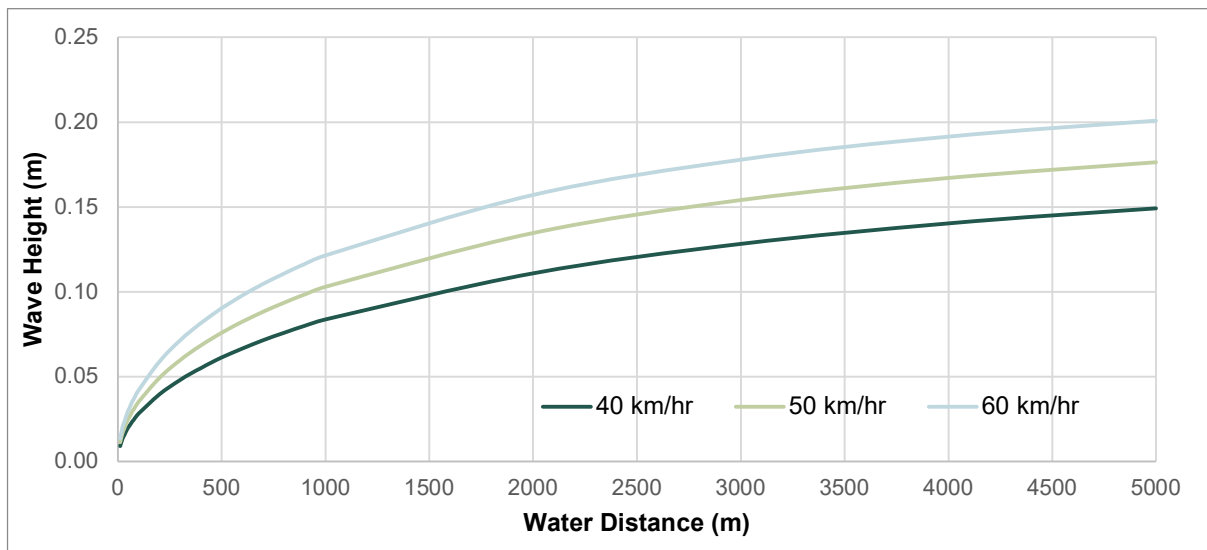


Figure 1 – Wave height vs distance across pond for various wind speeds. Adapted from – Coastal Engineering Research Center. Shore Protection Manual, 1984.

Wave heights from Figure 1 are rounded to the nearest 100 mm and doubled as an additional safety factor to achieve the recommend freeboard height in Table 1. The 60 km/hr wind line is used. For example, for a pond with a maximum water distance of 500m under a strong wind of 60 km/hr, the resulting wave height would be 90 mm. Rounding this up to 100 mm, and doubling gives a recommended freeboard height of 200 mm.

## Contact

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