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Review of Coastal Erosion Hazard Line
Cardno (formally Cardno Lawson Treloar)
August 2010

Our Ref LJ2881/L2160 :sge

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3 August 2010

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Dear Sir,

SANDY BEACH NORTH RESIDENTIAL DEVELOPMENT
REVIEW OF COASTAL EROSION HAZARD LINE

Preamble

In previous correspondence, Cardno Coastal Ocean and Environment (formerly Cardno Lawson Treloar) have reviewed flood levels and entrance berm level issues related to Hearns Lake. Those matters are reported in our letter L2115.

Following our meeting on 26 August 2010 with the NSW Department of Planning, at which time those and other issues in relation to the proposed Sandy Beach Residential Development were discussed, the purpose of this letter is to address aspects of the coastal erosion hazard line developed by Patterson Britton (2004) for 45 Hearns Lake Road; and as per Worley Parsons email dated 16 November 2009 – see Annexure A.

Coastal Erosion Hazard Line

Definition of coastline hazard zones in the vicinity of the Sandy Beach North Residential Development was undertaken by Patterson Britton & Partners (PBP) within the Coastal Hazard Definition and Lake Entrance Processes study for 45 Hearns Lake Road, Woolgoolga (Patterson Britton, 2004). Cardno Lawson Treloar (CLT, now Cardno) were engaged by Sandy Shores Development Pty Ltd (SSD) to review this work in order to confirm the appropriateness of these definitions, particularly in light of the recent DECCW sea level rise benchmarks (DECCW, 2009a).

In preparing the hazard zones for the Sandy Beach area PBP followed guidelines specified within the Coastline Management Manual (NSW Government, 1990). Furthermore, the outcomes of the hazard definition studies fulfil the requirements of the recently released Coastal Risk Management Guide (DECCW, 2009b - draft), being the mapping of coastal hazard planning areas under future planning horizons, albeit with sea level rise values different from the recent State Government Benchmarks.

Within the study a number of coastal hazards were defined; namely:-

- Beach Erosion
- Shoreline Recession
- Sand Drift
- Coastal Inundation
- Stormwater Erosion and
- Slope Instability
- Climate Change

The assessments of Sand Drift, Coastal Inundation, Storm Water Erosion and Slope Instability are considered appropriate and further discussion of these points is not required.

Beach erosion was defined by numerical modelling of storm bite under the 100-years ARI offshore storm condition and consideration of historical measured storm demand values and extremal analysis as outlined in Gordon (1987). The storm bite modelling showed that the site is relatively protected in terms of storm demand as a result of the flat nearshore seabed slope. CLT have found that numerical modelling of this kind generally under-predicts expected storm bite volumes because the effects of other processes such as rips are not included. This was accounted for by adopting a much larger value, 200m^3/m above 0mAHD, based on observed storm demand values and subsequent analysis by Gordon (1987). This value is significantly higher than the approximately 50m^3/m above 0mAHD estimated by the modelling and, while some under-prediction is expected from the numerical modelling, the adoption of 200m^3/m above 0mAHD is conservative. Values in the the order of 160m^3/m above 0mAHD are generally applied for 'low demand' open coast locations (Gordon, 1987).

Analysis of photogrammetric data over a 60-years period suggests that the beach compartment in the vicinity of the development is stable or showing trends of accretion. Comparison of the photogrammetric data between the years 1943 and 2000 showed a 20m (typical) seaward shift in the position of the vegetation line, and up 40m at the northern end of the property. However, in the application of long term recession to the hazard line definition, an annual recession rate of 0.05m/year was applied resulting in a 5m recession over the 100-years planning period. This was done in order "to account for uncertainties in future behaviour". Given the observed historical shoreline response at this site, this is considered conservative as stated by PBP and assumes that the observed trends will not continue into the future.

It is generally considered that sea level rise resulting from predicted future climate change will also influence long-term shoreline recession. Application of the Brunn Rule, as specified by DECCW (2009b), assumes that the beach profile will maintain its equilibrium form. In doing so, a landward shift of the shoreline position would occur. Shoreline recessions under two planning periods, 2054 and 2104, were calculated based on an active nearshore slope of 1 in 40 and a closure depth of -11mAHD. Both these values are considered appropriate for this site and this resulted in recession values of 8m and 20m, respectively.

The NSW Government recently released Sea Level Rise Benchmarks for planning out to 2050 and 2100. These specify that sea level rises of 0.4m (2050) and 0.9m (2100) should be adopted. Sea level rise values of 0.2m and 0.5m were applied by PBP (2004). A sea level rise of 0.9m would result in a shoreline recession of 36m, some 16m greater than previously investigated. Hence, based on current sea level rise guidance the potential recession resulting from sea level rise has been underestimated.

It is noted, however, that in email correspondence sent by Worley Parsons on 16 November 2009, the message and attached plan describe the 2100 erosion hazard line in terms of 0.9m sea level rise, see Annexure A.

Finally, mapping of the hazard lines was undertaken by applying the storm demand and recession values from the 2004 beach condition. It is stated that this condition is representative of "current average beach full conditions". Typically, a mean beach profile and shoreline position, as defined from longer-term photogrammetric analysis, would be used to define the starting profile/volume of the beach. However, given that longer term accretion of the beach compartment has been observed, utilisation of the 2004 full beach condition could be considered appropriate.

Overall, the definition of the erosion hazard line has been undertaken with sound application of industry standard and government endorsed methodologies. Some conservatism is included within the assessment of storm demand and underlying shoreline recession.

Provided that the 2100 erosion hazard line defined by Worley Parsons with 0.9m sea level rise is adopted by SSD, Cardno advise that the outcome is reliable and is consistent with current NSW government guidelines.

Conclusion

The outcome of this review is that the erosion hazard line presented in Annexure A conforms to DECCW guidelines in terms of the investigations and methods applied, as well as in terms of current sea level rise policy.

Yours faithfully,

P.D. Treloar
Manager - Coastal, Ocean & Estuarine Studies
for **Cardno (NSW/ACT) Pty Ltd**

References

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Worley Parsons – Patterson Britton & Partners Pty Ltd (2008): Climate Change Assessment for Proposed Development at Sandy Beach North, Issue No. 2. Report Prepared for Sandy Shores Development Pty Ltd.

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Annexure A

Erosion Hazard Line for 0.9m MSL Rise

FIGURE

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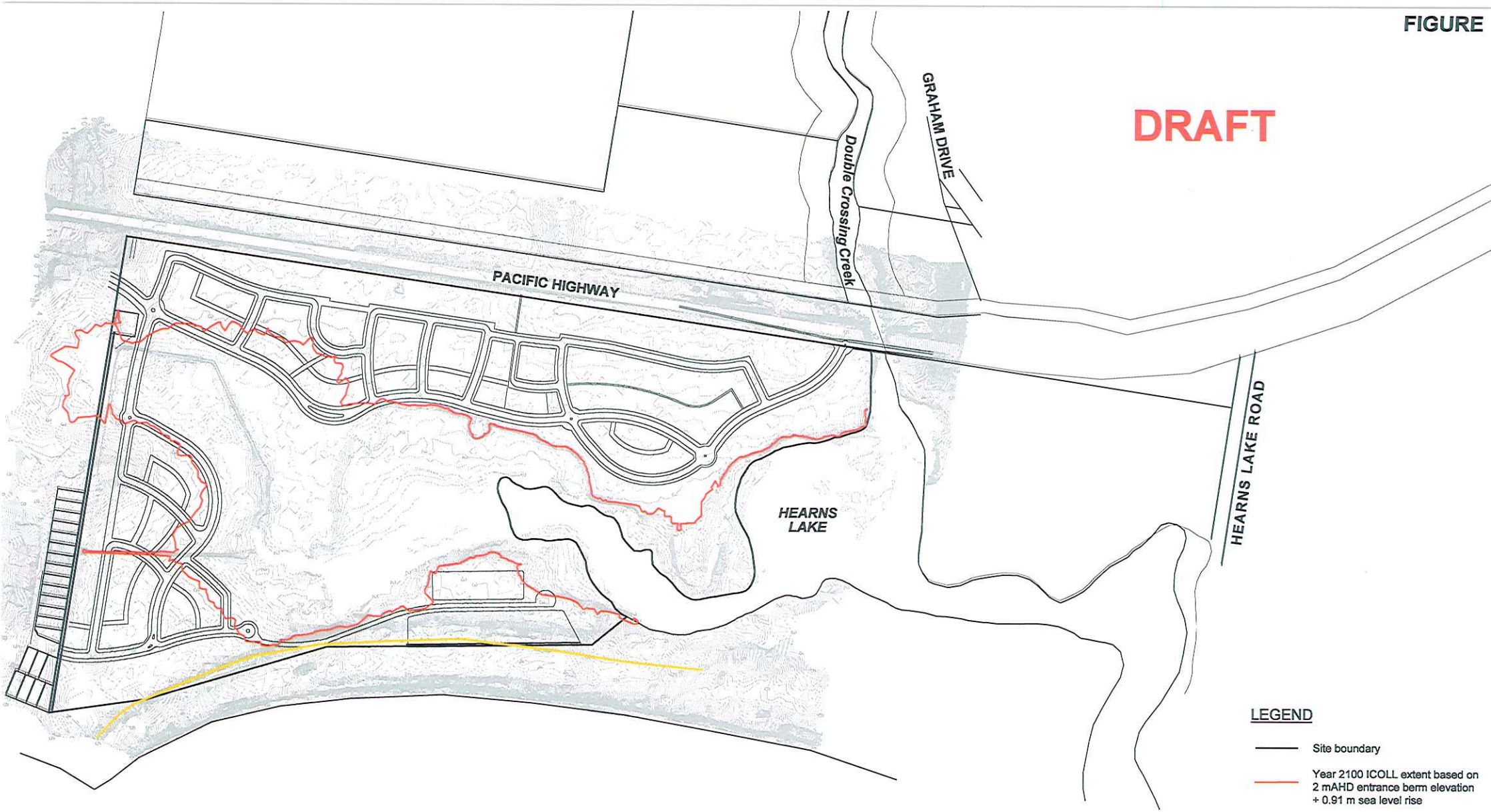

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