APPENDIX A. DISTURBANCE ANALYSIS BY DR ERROL STOCK.

SOUTH BANK CUDGEN CREEK 1944-2007 —

LANDSCAPE CHANGES BASED ON AIRPHOTO RECORD

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Background

Everick Heritage Consultants Pty Ltd requested a brief summary of landscape changes evident in the serial photographic record of the area of interest. Nine single aerial photographs (no stereo coverage) were supplied to cover Lot 490 and general vicinity. The set task was to identify any lands that may not have been disrupted by natural processes and human disturbance during period covered by the photographic sequence 1944-2007. Such lands, where evident, are more likely to retain in situ archaeological materials, if they were originally present.

Digital files of extracts from aerial photos for 1944, 1962, 1966, 1970, 1977, 1986, 1993, 1995, and 2007 were used to print hardcopy images at various scales for visual comparisons. This report contains a brief summary of major features and changes. A small area is identified for closer study.

Main Features and Changes 1944 – 2007

Introduction

The descriptions and interpretations here were made on printouts at various scales from digital files made by scanning single aerial photographs. No details of approximate scales and timing of the original photography we supplied. Consequently, the interpretations are affected by these factors and the usual caveats should be applied.

Cudgen Creek exits immediately south of the Cudgen Headland. Streams on this coast, which has a predominant northerly transport of littoral sand, commonly adopt this position. The area immediately inland of the shoreline retains evidence of two phases of coastal progradation during high stands of the sea (Roy 1973, 1982, 1984; Troedson et al. 2004): the first during the Eemian Interglacial about 125 ka (late Pleistocene “Inner Barrier”) and the most recent since around 7 ka (late Holocene “Outer Barrier”).

Deposition of the Outer Barrier sediments followed substantial erosion of the considerably older Inner Barrier sediments. Consequently, any archaeological materials on the eastern side of the original Inner Barrier dunes would have been lost during the erosion and deposition events associated with natural transgression events of the late Holocene. Archaeological materials on this sandy terrain can only be less than the age of the local ground surface and these can be lost to natural processes of disturbance (bioturbation, wind and water erosion and deposition) and human activities of excavation and construction.

Interpretation

Lot 490 - Original Beach Ridges

Beach ridges and swales, covered in dense vegetation and also cleared, are evident on the 1944 image of the subject land. These sand deposits are Outer Barrier sediments according to Roy (1973). Roy also identified Inner Barrier Pleistocene beach ridges on the north side of the estuary but they are further west. Sequential aerial images of the subject land show a history of bridge construction, sandmining of the beach ridges and swales for heavy minerals and subsequent rehabilitation, two realignments of a highway exiting south from the bridge, and urban settlement south of the southern boundary. Detailed examination of the images indicates that almost all of the original landforms of Lot 490 have been severely disrupted. Sand mining of the beach ridges and swales is evident in the1966 images, mostly in the eastern part of Lot 490. But this disturbing activity occurred before 1996 as shown in the 1962 aerial image of the area reproduced in Evans and Messner (1982). Subsequent images show additional disturbance associates with rehabilitation: topographic shaping, topsoil spreading, revegetation and construction of a highway. A realignment of the highway to give a reversed-S curve immediately south of the bridge also created surface disruption. In summary, the original landscape of Holocene Outer Barrier beach ridges and swales have been profoundly disturbed.

In my opinion, any archaeological materials on almost all of the eastern part of Lot 490 would have been lost.

However, the comparisons and superimpositions of the images show a possible exception to this severe disruption may exist for a narrow triangle of land immediately east of the straight boundary of the semi-circular northern tip of Lot 490 (Arrowed uncoloured area Figure 1). A strip of land, up to 50 m wide and 200 m long, may have survived excavation and/or burial during the dredging and topographic reshaping of rehabilitation. If plan details of this strip are required then photogrammetric plotting using geo-registration will be necessary. In any case, for best use of resources in a ground search for any surviving archaeological materials, this least-disturbed strip appears to have the best potential.

Lot 490 – Reclaimed Peninsular-Island

A substantial proportion of the western side of Lot 490 is reclaimed land using sand from mining and dredged from Cudgen Creek. The 1944 imagery shows a natural peninsular-island in Cudgen Creek estuary has low-relief sediments drained to the northeast by small meandering channels. In 1944 this area also may have had some natural remnants of beach ridge sedimentation but they would have been very small. Given its location in the estuary the westernmost remnants (now the northwest corner of Lot 490) could have been Inner Barrier late Pleistocene in age. However, even if these were present, any original archaeological materials of this peninsular-island have been lost by two activities: sand mining (dredging, rehabilitation) that had reached this area by 1970; and, the placements and mixing of sands reclaimed from the estuary.

In my opinion, any archaeological materials on this western part of Lot 490 would have been lost

Lot 490 – Estuary Section of Cudgen Creek

Lot 490 has a western boundary contiguous with a small part of the Cudgen Creek estuary. The 1944 aerial image shows the estuary is unbridged. In this near-original state there are shallow sand deposits with a narrow channel that almost touches the northwest tip of the peninsular-island and hugs the northern bank of the estuary. Sequential aerial images show that the estuary has been dredged as part of navigational, mining rehabilitation and land reclamation activities. Three deep holes with

downstream sand walls are evident in the 1979 image. (Additional dredging had already been carried out downstream of the bridge, as evident in the 1962 image.) Except for some minor sand additions on their downstream sides there appears to have been little change to the upper surface of the in-estuary walls of the dredged holes. Evans and Messner (1982) estimated some 350 000 m^3 bypassing the trained entrance of Cudgen Creek and concluded the estuary was close to a balanced supply-loss position. Evidently, if sand is in train in the estuary there has been little change to these holes since they were first formed.

Along the right-hand estuary bank and contiguous with the western boundary of Lot 490 the aerial images show minor erosion and deposition of sand. Mangroves have colonised this boundary, especially in the area identified as Environmental Protection 7(a) southwest from the southern bridge footing. This triangular area is adjacent to the narrow strip of least-disturbed land already identified on Lot 490. However, only along their shared boundary is there likely to be very small parts, which have remained undisturbed.

Conclusions

The original landscape of Holocene Outer Barrier beach ridges and swales (evident in the 1944 aerial image) has been profoundly disturbed. In the western part of Lot 490 what was a peninsular-island in 1944 has been completely replaced by sand mining and reclamation. In my opinion, any archaeological materials on almost all of Lot 490 would have been lost.

However, along the far north-western tip of Lot 490 a strip of land up to 50 m wide and 200 m long may have survived excavation and/or burial during the mining, dredging and topographic reshaping of rehabilitation. Even though its edges may have been encroached and disturbed there appears to be potential for this area to retain some archaeological materials that elsewhere on the subject land have been lost to land disturbance.

Figure 14 - 1944 Aerial View of Lot 490

Figure 15 - 1962 Aerial view of Lot 490

Figure 16 - 1966 Aerial view of Lot 490

Figure 17 - 1970 Aerial view of Lot 490

Figure 18 - 1979 Aerial view of Lot 490

Figure 19 - 1986 Aerial view of Lot 490

Figure 20 - 1993 Aerial view of Lot 490

Figure 21 - 1997 Aerial view of Lot 490

References

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