APPENDIX 8A

COVER SHEETS FOR STATEMENTS OF EVIDENCE

STATEMENTS OF EVIDENCE

IN THE RESOURCE MANAGEMENTS AND PLANNING APPEAL TRIBUNAL

TRIBUNAL REFERENCE NUMBER: 119/15P

APPELLANT: BROWN & DOWNING

1ST RESPONDENT: KINGBOROUGH COUNCIL

OTHER RESPONDENTS (IF ANY):

PARTY JOINED (IF ANY): FRIENDS OF NORTH BRUNY INC.

AUTHOR: DR CHRISTOPHER WATSON

FIELD OF EXPERTISE (IF ANY) Research Scientist, Sea Level & Geodynamics

FIELD ON BEHALF OF: FRIENDS OF NORTH BRUNY INC.
(APPELLANT, RESPONDENT OR THIRD PARTY)

I have read the Expert Witness Code of Conduct and agree to be bound by it.

DATE: 10 May 2016

STATEMENT OF EVIDENCE

IN THE RESOURCE MANAGEMENT AND PLANNING APPEAL TRIBUNNAL

TRIBUNAL REFERENCE NUMBER: **119/15P**

APPELLANT: **BROWN & DOWNING**

1ST RESPONDENT: **KINGBOROUGH COUNCIL**

OTHER RESPONDENTS (IF ANY): **FRIENDS OF NORTH BRUNY INC.**

PARTY JOINED (IF ANY):

AUTHOR: **DR CHRISTOPHER WATSON**

FIELD OF EXPERTISE (IF ANY): **RESEARCH SCIENTIST, SEA LEVEL AND GEODYNAMICS**

FILED ON BEHALF OF: **FRIENDS OF NORTH BRUNY INC.**

DATE: **6 MAY 2016**

I have read the expert witness code of conduct and agree to be bound by it.

SIGNATURE:

1. I, Christopher Watson, am a research scientist at the University of Tasmania with over 10 years of post-doctoral experience in sea level studies and geodynamics. I lead an Australian team that contributes to the United States (NASA) and French Centre National d'études Spatiales (CNES) science team that oversees satellite missions used to observe sea level rise. I supervise at the doctoral level across fields that include sea level rise and impacts of sea level rise spanning global to local scales. I regularly publish and provide expert peer-review in the international peer-reviewed scientific literature including the leading outlets *Journal of Geophysical Research*, *Nature Climate Change* and *Journal of Coastal Research*. I am familiar with the literature pertaining to sea level rise and associated impacts including coastal erosion.

2. I wish to disclose that I am the lead PhD supervisor to Chris Sharples, with whom I have discussed aspects of the development application that is the subject of this document. The evidence presented here is my own.

3. Numerous irregularities exist within the coastal vulnerability assessment undertaken for the appellant by Geo-Environmental Solutions and reported in April 2015 (hereon: “GES, 2015a”), and in the addendum report dated August 2015 (hereon “GES, 2015b”):

a. Aerial photography was identified by GES (2015a) as an appropriate method to investigate prior shoreline change but ultimately was not undertaken. GES (2015a) state (pg 29) “Google satellite images indicate that the central areas of Jetty Beach are in fact prograding”. No evidence (or uncertainty) to support this claim was provided.

b. GES (2015a) undertake coastal recession modelling to infer likely recession based on presently accepted 2065 and 2100 sea level rise scenarios (§10.1, from pg 29). The models applied are the standard Bruun rule (Table 18) and the modified (generalised) Bruun rule (Tables 20 and 21). GES (2015a) presents Fig 12 (pg 31) claiming in the caption that it represents the “Generalised Bruun Rule”. While it is true that a subset of the variables in the figure are used in the

generalised Bruun rule, the caption is disingenuous – it actually represents the schematics of the Shoreface Translation Model (STM), as per the publication where the figure was obtained but not cited (Fig 2, pg 235: Cowell, P., Thom, B., Jones, R., Everts, C. and Simanovic, D. (2006) Management of Uncertainty in Predicting Climate-Change Impacts on Beaches, Journal of Coastal Research, 22(1) pp232-245).

c. When computing the predicted recession of Jetty Beach (§10.1.2), the standard Bruun rule is applied. GES (2015a) use an incorrect 'active dune / berm height' (variable D) of 5.0 m (Table 17, pg 30). The 'active dune height' for application to the Bruun Rule is that of the main dune immediately backing the beach. According to the detail survey / site plan submitted by the appellant, the height of this dune/scarp facing the sea at Jetty Beach ranges in elevation from ~2 m at the northern end, to ~3-4 m at the southern end of the relevant title. Using a uniform 5.0 m as the dune height will lead to an under prediction of the coastline recession using this model. The formula presented for the standard Bruun rule (pg 30) is incorrect, and using the variables provided by GES (2015a) in Tables 17 and 18, it is impossible to exactly reproduce the output values provided in Table 18.

d. When computing predicted recession of Dennes Point (§10.1.3) the modified (generalised) Bruun rule is applied given the rocky substrate. GES (2015a) use 'dune height' as 4.0 m (Table 19, pg 31) for both the south easterly swell and northerly wind wave scenarios. This value implies that there is a 4 m sandy dune immediately backing the water/land interface. For the majority of Dennes Point the immediate shore face is a boulder field with very little frontal dune suggesting that the Bruun rule is poorly suited.

e. Tables 20 and 21 in GES (2015a) are incorrectly captioned as they refer to Jetty Beach when in fact these estimates appear to be for Dennes Point.

f. The GES (2015b) description of the vegetation over the site is grossly incorrect: “moderate cover of native tree and understorey species”.

g. GES (2015b) state that “A number of auger holes were completed to identify the distribution of, and variation in soil materials on the site.” Information was only provided on a single core, and the location of that core was not provided.

4. Following from 3(a-g) inclusive, the relevant sections of GES (2015a) and GES (2015b) that pertain to assessing the potential risk from inundation/storm surge (incorporating sea level rise) are flawed. The evidence presented by GES (2015a) and GES (2015b) does not support the conclusions reached regarding the risk from inundation/storm surge.

5. Central to assessing the recession and storm erosion risk is achieving an understanding of the spatial distribution of the erodible soils as well as any underlying substrate that may not be readily erodible. As per point 3, GES (2015a) and GES (2015b) inadequately address this with the only evidence provided referring to a single core sample of unknown spatial location. Subsequent information provided by the appellant (February 2016), detail two cores that have been drilled and analysed on land comprising CT148618/10.

a. From the information provided by the appellant, the first core was taken downslope (seaward) from the proposed dwelling site at approximately ~2.8m AHD. The core reached refusal at ~2.1m depth, i.e. ~0.7m above present sea-level.

b. Again from the information provided by the appellant, the second core was taken at the site of the proposed dwelling (~3.0-4.0m AHD) and was terminated at a depth of ~2.0m (i.e. there was no refusal by hard material).

6. Given 5(a) is the only core to reach refusal:

a. It is impossible to conclude that an isolated boulder/cobble was not the cause for the refusal of this first core. Dennes Pt is known for its unusual boulder field (see for example the analysis by Cromer (2015) “An unusual boulder spit at Dennes Point on Bruny Island”. Avail at http://www.williamccromer.com/an-unusual-boulder-spit-at-dennes-point-on-bruny-island/. Accessed 29 Feb 2016).

b. It is impossible to conclude that the refusal met at the core described in 5(a) is from a material that is not readily erodible (for example, a boulder-clay / weakly cemented conglomerate as described by Cromer, 2015).

c. It is impossible to determine the spatial extent of any erosion-resistant material below the proposed development that will dictate the extent of potential erosion under future sea level rise and storm surge scenarios.

7. The cores described in 5 (a) and 5(b) show that the top ~0.8-1.3m (respectively) are comprised of sand. This is consistent with the interpretation by Sharples and Donaldson (2014) (Sharples, C., and Donaldson, P. (2014) “A first pass coastal hazard assessment for Kingborough local government area, Tasmania”. Report to Kingborough Council, December 2014) who describe the area at the site of the proposed dwelling as “hummocky vegetated transgressive dunes” (§4.36.2, pg332) (More completely: “Behind the single well-formed foredune ridge backing Jetty Beach, hummocky vegetated transgressive dunes extend over 100 metres further inland and represent formerly mobile sands blown inland from the foredune”).

8. It is likely that the Jetty Beach foredune will be eroded under future sea level rise given it has a maximum elevation of just ~2m above AHD (from the survey data provided by the appellant). The area immediately behind the foredune at the northern end of CT148618/10 is lower in elevation (~1.5 m above AHD). Given this configuration, once this foredune is breached, the lower area immediate behind will be particularly susceptible to erosion. This will lead to significantly increased risk that the region immediately seaward of the proposed dwelling

location will mobilise under future sea level rise and storm surge events (given the upper sections of the soil (at least) are readily erodible as per core detailed in 5(a)). In addition, the 3 m AHD contour passes directly through the location of the wastewater treatment (as per drawing provided in GES, 2015b), and is through or above the proposed driveway. Both of these components of the development will therefore be a “high risk” as defined in KPS(2000) Schedule 1, Clause 1.2.4.1.

9. Annexed hereto and marked “Annex A” are aerial images of the region centred on CT148618/10 acquired in ~1948 and ~2012. The image acquired in ~1948 shows a comparative lack of vegetation over the proposed development site (outlined in red), that is consistent with wind driven sand and unconsolidated vegetation over the development site. This information further supports the interpretation by Sharples and Donaldson (2014) that the area behind the foredune along Jetty Beach is a vegetated transgressive dune. An expert in coastal geomorphology such as Sharples could confirm this interpretation.

10. Following from 5, 6, 7, 8 and 9, it is impossible to conclude that land at the proposed dwelling location, or at the location of ancillary items including the wastewater treatment and access drive, is not actively mobile over time scales of relevance (e.g. 50-100 years). It is also impossible to conclude that there is not significant risk that the land will not become far more mobile given sea level rise, storm surge and associated erosion. This suggests that the development is not in accord with KPS (2000) Schedule 1 Clause 1.2.3.1 Alternative Solutions (a) to (c).

11. Annexed hereto and marked “Annex B” is a map showing the distance from the top of the existing foredune / frontal scarp to the midpoint of CT22067/1 (Dennes Point Lane). The observed distance is ~29 m.

12. Given 9 and 11, parts of the proposed access on CT22067/1 (Dennes Point Lane) are considered to be within 30 m of a dune, hence the proposed development of

the access does not meet the requirements set out in KPS (2000) Schedule 1 Clause 1.2.2.1(c) because it is not located further than 30m measured horizontally from the furthest landbound extent of *any dune* or actively mobile land to minimise the risk of sand drift or erosion.

13. Given 7-0 inclusive, both 21 Dennes Point Lane and Dennes Point Lane itself are considered to be within the “coastal area” (relevant to Clause 1.3.3 KPS (2000) and in accordance with Schedule 5 clause 5.1.1, “Waterways, wetlands and coastal areas are highly susceptible to human degradation and should be accorded the highest level of protection”.

Annex A – Aerial images of the Dennes Point region centred over CT148618/10. Image acquisition dates are ~1948 (left) and ~2012 (right). Note the images are not rigorously georectified or georeferenced, and are shown here for qualitative purposes. Note the comparative lack of vegetation over the proposed development site (outlined in red). The lighter coloured region in the left image is consistent with wind driven sand and unconsolidated vegetation. This information further supports the interpretation by Sharples and Donaldson (2014) that the area behind the foredune along Jetty Beach is a vegetated transgressive dune.

Annex B – Map showing the distance from foredune to midpoint of CT22067/1 (Dennes Point Lane). Distance is shown in red dashed line (~29 m from top of foredune to midpoint of title where proposed works are required). CT22067/1 shown highlighted in blue. Map from http://maps.thelist.tas.gov.au/ and also verified from appellent's site map.