

THE JOINT STANDING COMMITTEE ON ENVIRONMENT, RESOURCES AND DEVELOPMENT MET IN LAUNCESTON CITY COUNCIL CHAMBERS, ST JOHNS STREET, LAUNCESTON, ON TUESDAY 3 JUNE 2008.

COASTAL EROSION

Dr JOANNA ELLISON WAS CALLED, MADE THE STATUTORY DECLARATION AND WAS EXAMINED.

CHAIR (Mr Hall) - Welcome, Dr Ellison to this committee on coastal erosion. I invite you to make a start and then members can ask questions.

Dr ELLISON - On the written submission I gave some background on coastal erosion and sea level rise and how they come together. That will conjoin with the presentation of my colleague, Chris Sharples, who I understand is talking to you tomorrow. We will talk to each other so we don't overlap! To give you a bit of perspective, my presentation today will follow my submission with a few additions.

Tasmania has had a relatively stable sea level for the last few thousand years, but before that there was a significant period of sea level change. As you can see from these pictures, Tasmania used to be connected to the mainland and it became isolated as an island as the sea level rose. This was during the period of the collapse of the last glacial ice sheets, which geologically it is not a great length of time ago - it is relatively recent. We are not talking about rock age years, this is sedimentary years. However, the significance of this sea level change is shown here - the sea level is rising quite rapidly to where it is at present - that was probably about 5 000 years ago.

These three curves look a bit scratchy the way they are put together but they are really strong in that they show to you the immense similarity - we have the present on the right, going back to 120 000-140 000 years ago on the left. This is basically the last glacial-interglacial cycle, so this is when sea levels were previously higher during the last glacial maximum and then, with the build-up and subsequent collapse of the American and Eurasian ice sheets, the sea level rose again. You can see that sea level is really closely correlated with temperature and atmospheric CO₂, so the CO₂ curve comes from ice bubbles in ice cores. The middle-curve - temperature - comes from the deep ocean and the bottom curve comes from dating of sea-level indicators. So they are completely different sources but great correlation. What this means for Tasmania is that we have to accept the IPCC determinations for the projections because they are such a considered and reliable source of evidence. I think we need to accept the IPCC, which is very much on this argument that temperature will drive sea level rise in the future.

For Tasmania, sea levels here have been stable for 6 000 years or so. Since that time when the sea levels change then you do not get sediments accumulating at the shoreline. When the sea level is stable then you get build out of sedimentary features such as beaches, dunes and salt marshes. So sedimentary coastal flats build out when the sea level stabilises and this is shown by dating of dune ridges on the east coast of King Island. This is the hard rock on the left and then increasingly young dunes built out as

the sea level has been stable. These are dune ridges which have been dated back and we could do this on many different places in Tasmania. The older dunes are usually about 5 000 to 6 000 years old on the active shoreline today, although, we do have some fossil dunes inland, which is different issue.

So if we look at the projections from the IPCC, in terms of coastal response - and these ranges are very broad - the projection is 0.18 to 0.59 metres. That is a big range and that has to do with the different models they are using and different uncertainties about emission scenarios in this century. But if we look at the rates of those, then the rate of change is of significance to coastal stability. So this is 1.8 to 5.9 millimetres per year.

Tasmania, as shown by John Hunter and Richard Coleman from Port Arthur, has had a rate in the last century of 0.8 millimetres per year of sea level rise, which is the global rate. That is what the whole world has experienced and is due to global warming, according to the IPCC. So we have a relatively low rate to date.

What will this increased rate of sea level rise mean to Tasmania? One way we can look at that is to go to different parts of the world. Here is Tasmania in the very middle of the plate, very stable tectonically, but other parts of the world are not. We can go to different places which have a sea level rise rate which is similar to what Tasmania is expecting this century. You can see what is happening there and how they are responding. I have done a lot of work in American Samoa, which is on the Pacific plate, as the plate comes into the Australian plate. The Pacific plate is coming into the Australian plate just north of New Zealand and Samoa is subsiding, so that has had a sea level rise rate of about 1.43 millimetres per year - double what Tasmania has had. This has gone on for a long time. These are El Ninos - do not worry about them. American Samoa is a small island with some beaches, but quite mountainous with a concentration of settlement at the coast. I have been working there for quite a few years now looking at how their coasts have responded. It is a tropical place, so I am talking about mangroves which are very similar to salt marshes in Tasmania. Mangroves are just trees growing into tidal woods. This is a mangrove area on the south coast - that woody lagoon you can see and the mangroves used to grow out into the centre of the lagoon, but they have been retreating. We use GIS to show that the mangrove retreat has been about 200 square metres per year over the period of our photography. So they have retreating mangroves similar to salt marshes.

There is also coastal erosion. Here you can see the loss of sediment at the coast and some attempt at coastal engineering that basically washes out sediment at the coast, so there is beach erosion as well.

The response of American Samoa: because they are a United States territory, they can call up the United State Army Corps of Engineers and because it is a small island they have gone heavily into coastal engineering, as you can see. This is not on all stretches of the coast but on some of it. It is highly expensive to do this but it is not successful in many ways. There are off-shore effects. But that is what they have done and it has been successful at stabilising their coastline. You can see they have a very narrow coastal strip on many sections. So it was strategic to do that. That is the road between the capital and airport.

Another place we can go is southern Louisiana and Texas where they have rates of sea level rise. This is where New Orleans is, which is of fame due to the disastrous hurricane Katrina. These places are on deltas. The delta is building a massive geomorphic structure on the offshore which tends to subside because the sediment compacts. Also the plate underneath is weighted and so the tectonic plate itself sinks and they tend to get sea level rising in the patches that you saw in the last picture of 7 to 10 mms per year. These are within the rates that Tasmania can expect.

These are coastal salt marshes behind a barrier beach and there is conversion of salt marshes, similar to those we have in Tasmania, of between 65 to 90 square kilometres a year in loss. This is a relatively high rate compared with what Tasmania has projected for this century, but still Tasmania only has 37 square kilometres of salt marsh. They are not extensive in Tasmania because we have a smaller tidal range.

But there is very strong evidence from Louisiana that salt marshes just disintegrate. So we set up monitoring of salt marshes in Tasmania which currently look really good - Moulting Lagoon, Little Swanport and other salt marshes in Tasmania. I have had a project recently in the Tamar with my PhD student, Matt Sheehan, who is just about to get his PhD. The Tamar is a salt marsh environment infested by sporting, and these surveys have shown that recently there has been extensive erosion of the foreshore of virtually all the major parts of salt marsh in the Tamar.

I have never presented this outside scientific areas before, but if we look at one of Matt's transects it is basically surveyed from the shore to the reoccupied previous transects and this has demonstrated, from previous surveys and his own, that the edge has been retreating from a shelving edge. It is becoming more of a cliff face and when you find a cliff in a sedimentary environment it means there has been erosion because sediments do not build up to form a cliff, they build up to form a flat feature and then they get eroded to form a cliff, so wherever you see a cliff like that it means erosion.

Throughout the Tamar we do not really know why this is happening. It is probably a combination of sea level rise and other factors, but I suspect that boat wake erosion is a problem. Within that one profile - that is a 20 square metre block - and if you multiply that by that photograph that comes to 2 000 cubic metres of sediment eroded from this factor. As you know, there is a problem of sediment in the Tamar, so erosion is occurring already in Tasmania.

If we go to Chesapeake Bay just south of Washington DC, we find that it is a lovely drowned river valley very similar to the Derwent. There they have about 4 mms of sea level rise per year. I will not go into why, but they do. There has been extensive loss of salt marsh around there: on that island the previous cover of aquatic vegetation - salt marsh - has been decimated in recent decades.

Ms THORPE - Is that the green area?

Dr ELLISON - Yes. Fragmentation of salt marsh, as you can see in the bottom picture, is rife. It tends to just fall apart from the middle out and it is a bit like putting tissue paper on a wet surface - it fragments like that - and that is what is shown in Louisiana as well.

CHAIR - That is over 50 years, is it?

Dr ELLISON - Yes, but extensive loss. To the south of DC is Cape Hatteras, where they have extensive coastal barrier beaches, and these demonstrate the problem of sea level rise causing coastal retreat. When this lighthouse here was built in 1870 there was 500 metres of beach in front of it, and since then 400 metres or more has been eroded, the island has retreated backwards, and there has been beach erosion. Subsequent to that photo, they dismantled that lighthouse and shifted it inland by another half kilometre to stop it being undercut. So that's a good indication of beach erosion with sea level rise. With normal beaches and with stable sea level, they tend to build up, as I have shown for King Island. Older dunes, then younger dunes, and then the fore dune which is currently being built.

When they are cut back, you tend to have cliffing, loss of the fore dune, and this has been shown to happen with a rising sea level at a number of locations through the world. It is due to what is called Bruun Rule. You'll probably hear a lot about this in the next couple of days. With sea level rise 1 up to sea level 2, the previous profile 1 moves to 2, and the net effect of this for you guys is that you get erosion above mean sea level where the beach is. You get erosion from that profile 1 to profile 2, and the material gets deposited offshore.

The reason for this is quite easy to understand. Imagine your favourite beach profile, your favourite beach where you go surfing or whatever. That has an angle, a shape, which is controlled by the grain size, the wave environment, where the bedrock is if there is any, and it has an average profile, which is its equilibrium profile. When sea level goes up, then all those things stay the same, but the conditions will try to re-establish the previous profile. In order to do that, it has to erode and deposit there, and that's what happens to re-establish the same profile with the prevailing conditions of the tide, the waves and the sediment.

That is a rather simplistic version of it, but it means that for every small amount of sea level rise, for every dimension of sea level rise, to put this straight, you get 50 to 100 times that lateral erosion of cutback into the dune, and you get loss of the fore dunes. This is Ocean Beach. You can see loss of that fore dune and cliffing back into the dunes behind. I don't know if this at Ocean Beach is due to sea level rise. We suspect it is, but it hasn't really been shown.

So of a 0.8 to 0.59 metre sea level rise, which is projected, we can expect 50 to 100 times that. It is quite a lot when there's a lot of intense development on coastline. The range is because of the differing conditions.

Ms THORP - That 0.59, that is about 600 centimetres in the next nearly 100 years.

Dr ELLISON - No. The next 100 years is 0.18 to 0.59 metres, and that is 18 to 59 centimetres. The projection is that sea level will rise up to maybe that much, but you can expect 50 to 100 times that in terms of natural erosion.

CHAIR - That's worst-case scenario.

Dr ELLISON - Yes. This goes from zero emission scenario up to business as usual. There's a range in there which is due to the emissions projection, that's in the IPCC, so with that

curve I showed earlier, the range of it is due to uncertainty about future emissions - the success of Kyoto and that sort of thing.

Ms THORP - But even on the zero-emissions projection, you're still looking at 9 metres of inland recession.

Dr ELLISON - Yes, according to the Bruun Rule. But there is a resilience; there's a lot of inertia in the system. It is slow to change but once it starts to change it is slow to stop changing in terms of climate change and climate change impacts. It has inertias, so we are not seeing impacts quite yet but once it starts it is hard to stabilise.

Venice, due to a delta to the north of it, the Po, has deltaic compaction sea level rise of 7 mm year. This is an urban example - we have fantastic cultural heritage - this is St Marks Square on the seaward end of it at low tide. This is St Marks Square at high tide. This used to happen very rarely but now lower Venice is flooded between 40 and 60 times a year and they reckon it will go up to 100 times a year. This is just due to high tide. Fortunately they have a big lagoon with barriers already there. They just have to close three entrances and it will improve that, but the estimated cost is gigantic for some reason and I'm not really sure why.

I am not going to get into coastal engineering, but that is obviously a big concern for maybe another inquiry about protection of cultural heritage. What is projected for Tasmania is within the rates that have been projected. I guess the main areas of concern to you are salt marsh beach loss; loss of islands, particularly small ones; and beach erosion. All that can be expected.

Mr HARRISS - Over what period of time?

Dr ELLISON - That is a hard question. As shown here, there is coastal erosion already. Ocean Beach may be eroding due to sea level rise already because it is such an exposed beach, because of the 0.08 we have had already. I wouldn't say it would be catastrophic until you get rates of that kind occurring in Tasmania. Our current sea-level-rise rate is still 0.08. If the rate were to double then you would see what is happening in, say, American Samoa.

Mr HARRISS - You have mentioned the expected similarity with Chesapeake Bay, getting up to, say, 4 mms sea level rise.

Dr ELLISON - That is projected for Tasmania by about 2030, I believe, with the worst-case scenario.

Mr GREEN - Was there a point of delineation with respect to sea level rise starting again, if you like? The reason for the question is that Aboriginal heritage in Tasmania is obviously very interesting and the Aboriginals were marooned effectively on the Tasmanian mainland as a result of sea level rise. I am told Bass Strait was once open country with a freshwater lake in the middle of it between 10 000 and 15 000 years ago. The original population was isolated here. Was there a point where that sea level rise stopped effectively and then we saw it start to rise again or has there been a slow continuation of sea level rise through that whole period since the Ice Age effectively? Is there a point of delineation with respect to sea level rise?

Dr ELLISON - Sea level seems to have been stable in Tasmania since about 5 000 years ago. Before that there was rapid sea level rise, little coastal sedimentation and the Aboriginal history as you describe. About 5 000 years ago it did become stable and it has been stable until the industrial era - supposedly. I have a PhD student who is working on Holocene sea levels, which is that period, because we don't have a study for it in Tasmania. The only record we have is the recent one from Port Arthur.

Mr GREEN - Was that recorded in Sydney Harbour? That is about the only record nationally, as I understood it.

Dr ELLISON - Port Arthur's tide gauge has been going since 1841.

For you, as a commission on coastal erosion, I really want to point out that coastal erosion happens due to reasons other than sea level rise. As a geomorphologist, I get a bit irritated when people point at sea level rises causing their coastal erosion when it is in fact something else.

Let me show you some examples. With Sandy Bay, here you can see a fore dune, well at least a dune which has obviously been eroded back because it has got that cliff. It has lost its fore dune. I do not know who has done it, and that is really beside the point, but this is coastal engineering which has been put around the base of that. The longshore drift is coming along towards us, so behind that protection there is an area which is not protected. That is eroded due to the strength of the waves coming around past the protection and then cutting into the next bit along.

This is very common in Tasmanian coastal engineering. It is very piecemeal without looking at the whole system. Just walk alongside Nutgrove Beach and you will see some great examples of how not to do it. That healthy fore dune in front of the dunes, when that is missing then that shows that the coast has eroded back. This is just to show you what to look for.

This is that area of the coastline in about 1910 - a nice broad beach. This is that beach today with protection and also erosion. A lot of this has to do with human impact on the coastal zone, people walking over dunes disturbing the grass which stabilises the dunes, disaggregating the sediment which then erodes during the next high energy event because it is not protected. Controlling human access to the coastal zone has been one of the objectives of Coastcare for the last 10 years. It is called resilience, keeping the resilience of the coast to outside impacts would be a great thing to encourage. Here you can see a really degraded dune with all the loss of the fore dune, so you must control where people walk over the dunes, fencing off the grassed areas so that the natural protection of the coastline is maintained. That is a really cheap way of doing it. Previously it has been done largely through community groups, just local community groups trying to do their thing for their bit of coastline, without much technical support.

CHAIR - Thank you very much for that. I noticed in the written submission that you talked about the fact we do not have the financial resources to remediate beaches which have been severely eroded because of the sheer cost in terms of engineering and everything else. Surfers Paradise is probably about the only such place in Australia. It seems to get

washed away about every 12 months and they put in bulldozers and try to sort it all out. You have probably seen all that.

Dr ELLISON - Oh yes.

CHAIR - You are probably implying in your submission that we need longer-term strategic approaches, particularly by councils and local authorities, in terms of where they allow future development and whether in fact some existing development may have to be pulled back in the future. Is that what you are suggesting there? I know this is probably a difficult area for State and local authorities to address but it may well be the case. Have you an opinion on that?

Dr ELLISON - Certainly I think that setting development back from the coastline would be very wise and if all this does not happen then you still have a great coastal strip in 200 years' time to move ahead and develop. But right now I think it would be very foolish to move ahead with further development of areas which are close to sedimentary coastlines, so sand beaches, dunes, because of the cost of defending that in the future. I have seen in Europe how coastal engineering has moved towards groyne construction so that they shore normal walls to try to keep the sediment on the coast - which are really ugly to look at. They do a good job at keeping the sediment from moving along and they do have some effects downstream.

CHAIR - I will ask a question which has something of a local context and has been touched on, the silting the Tamar. I think your organisation should be probably looking at the whole catchment plan of that in the future. There has been talk of the barrage down the Tamar which is a frightfully expensive bit of infrastructure. It has been suggested to me that regarding the existing areas of Invermay and Inveresk, if a barrage was put in that would in fact exacerbate or cause problems because the water table would rise. Maybe with global warming and an increase in water levels that would exacerbate that problem; if an infrastructure like that was done, that would cause even more issues in low-lying areas which are already under high tide?

Dr ELLISON - You would certainly need to strengthen the existing flood protection for that area. But, yes, there would be rising water tables which would affect probably the foundations of houses. I am not an engineer.

Mr GREEN - Does the silt provide a displacement factor of water, tidal water and the back water coming in?

Dr ELLISON - It does not cause the sea level to go higher.

Mr GREEN - No, but is there a displacement with the water that is running into the tidal flow as a result of siltation?

Dr ELLISON - What has happened in the Tamar is that because the silt has built up in the rice-grass banks, it has concentrated flow down the main channel and kept it open to some degree and that was the original intention of the Launceston Port Authority in introducing the rice grass. It has been a success but it does not raise the sea level. It just means that if there were to be, say, a flood down through the South Esk into the Tamar

from the North Esk then the Tamar estuary does not have the capacity to take that flood to the sea anymore because of the silt put out. But it does not affect sea level.

Mr GREEN - No, I knew it would not affect the sea level but I just thought there might have been a displacement factor and then you have a silt build-up as a result of the change which is then eroded into cliff faces.

Ms THORP - I take the point that you made quite clearly that there are lots of factors that cause coastal erosion and that we are quite specifically looking here at the impact of sea level rise. I note in your submission that you say, 'Therefore a long-term planning approach to deal with these changes if they occur may be prudent to adopt now'. You mentioned the precautionary principle and include anticipatory planning encompassing future plans to retreat from the coastline.

This committee is not looking at an argument about whether or not sea level rise is going to occur but more, what management tools we can suggest be put in place for local planning authorities and others to make sure the impact of sea level rise, when it does start to impact here, is minimised. If you were able to be head of the planning scheme in Tasmania now, what changes would you like to put in place?

Dr ELLISON - In terms of planning of developments, sure, we would keep back from the coastline. But there are a lot of smaller things which can be done which do not need someone of that authority, just to sidestep your question, initially. If the resilience of the coastline to resist these changes can be improved, then this coast will be stronger to remain where it is, and that is reducing other impacts. There is still no boat wake limit on the Tamar that I can see. So keeping boats away from the shoreline is important because boat wake is a highly erosive thing. The nature of the waves makes them erosive.

Revegetation - so supporting community groups in coastal revegetation and human access control. Things like that would really help at this point, and continuing community education. In terms of planning, in Louisiana a lot of the houses down in the lower delta are up on stilts, so you can even winch your car up. I am not kidding. I have no source for that apart from friends who told me. Just adapting people's lifestyles.

I feel that a concern for you is how to deal with the development that is already in the coastal zone. That is a really difficult question in that previous decisions have caused developments to be in areas which are now sensitive. What you can do is to stop development in future in areas that will become sensitive, but how to deal with the ones which are already in sensitive areas, freehold properties, that is a very difficult question which I am not sure I can fully help with apart from saying that coastal engineering is not the solution unless it is looked at in a big all-of-coast way because it can starve downstream areas of sediment supply.

Ms THORP - The identification of areas such as salt marshes and sediment beaches, and so on, wouldn't be difficult, would it?

Dr ELLISON - No. Chris Sharples has already done that; he will talk to you tomorrow. He has already identified all the areas in Tasmania which are vulnerable and put them on a scale of most vulnerable and less vulnerable, according to geomorphic factors. There

was a study done through DPIW which he is continuing to do. That has been done already, and he's got GIS maps of all of that.

Mr BOOTH - What do you see as the most critical threat, if you like, facing planners here in regard to protecting infrastructure, and so on, but also obviously areas that you haven't built on? Is it sea level changes? You've talked about other causes there - damage to the coastal dune systems, erosion from boat wake, and so on. What do you think is the thing that we need to be prioritising in terms of preventing coastal loss?

Dr ELLISON - There are different time frames involved here, Kim. There's the time frame of the next five years, the next 10 years, which is probably more what you are concerned about. If you can anticipate now what may happen in 50 years' time then I think Tasmania will really thank you for it because once it starts, it's going to get worse. The scary thing to me about this curve is what happens up there. This is an exponential curve. It's going up; it's not going to plateau off.

All of this will continue through the next century to come and here we're thinking about maybe the next 10 years, the next 30 years where things are not that dramatic. Because of the inertia in the system, if the sea level starts to rise, which it has done, then it will continue. Even if we were to stop all CO₂ emission right now, we'd still have 200 years of resilience and 200 years of inertia before things turn around.

We saw this with the ozone hole. We all stopped emitting CFCs, and yet still we have an ozone hole because of the inertia of these global systems to change. I know I am being a bit vague.

Regarding trying to prevent all future development in sensitive areas, I know these are the prime tourist spots but if you could make them into casual use or public use then it would make them more accessible to the public anyway.

Ms THORP - You're not suggesting no development at all on the coast, you're just saying do it back from the coast?

Dr ELLISON - Yes, keep it back and keep areas which are coastal sedimentary land for public use and step development back. That means you are not then using public funds to defend private development in terms of beach replenishment, coastal engineering and all of that, which doesn't really help anyway.

Mr BOOTH - I think it is fairly obvious that we would suggest that we draw a line in the sand under any more infrastructure development on soft sediment areas, but regarding areas that already have building infrastructure on them - and Chris Sharples has identified heaps of those areas around the coast that are very vulnerable - ought we not be taking more like a 50-year look at this and saying that, no matter what we do in terms of coastal protection, stabilising dunes and planting vegetation to slow the rate of change, if sea levels rise at the rate we're saying, it is inevitable that they're going to go anyway? Is it reasonable to suggest that we should be concentrating our efforts on fuller planning that I just spoke about, but also concentrating on retreat from those areas, if you like, rather than trying to ward off the inevitable? Isn't it a fact that no matter what we do they're going to get taken out, save building some huge dike around them or something like that?

Dr ELLISON - I think that probably would be wise but then you have the history of the property owners on those locations to deal with as well, and that is really hard with different stakeholder views of the situation.

Mr BOOTH - But for this committee, in terms of our deliberations, obviously we need good information. It seems to me that, if it is inevitable that in 50 years' time an area - and I won't name a particular area - that is built on soft sediment will be inundated, no matter what we do, should we not be facing that reality now?

Dr ELLISON - Yes, I think it would be a good thing. If you could try to face that one now I would be impressed. In the end it will cost less to not have to defend these places which are on drainable land. It would also free up the sediment so where you have development on coastal dunes really, it locks the sediment up and so that sediment is unavailable to interact with the coast anymore.

Ms THORP - That is like Clifton.

Dr ELLISON - Yes. Where you have things such as car parks behind the dunes, it removes the source of sediment supply to the beach and locks it up and makes the situation worse.

Mrs RATTRAY-WAGNER - I am interested in the types of vegetation that are used for putting on dunes. Have you done any studies or are you aware of any studies into what are the best types of vegetation to use in that area?

Dr ELLISON - I know that they exist but I wouldn't like to make a statement on that here. Certainly there are better ones and less good ones. The marram grass is supposed to be quite good at trapping sand but it has difficulties in Tasmania in being a non-native. It is not perfect.

Mrs RATTRAY-WAGNER - Would you suggest that there needs to be a more extensive study into the types of vegetation?

Dr ELLISON - Yes. A really good study would be to look at their sediment-trapping abilities. There have been studies on where plants grow and their botanical attributes but looking at how much sediment they trap and how effective they are trapping it would be a pretty good study with respect to Tasmanian natives. That hasn't been done.

Mr BOOTH - Levees around Invermay and Inveresk are a pretty topical issue at the moment. Would it be better, given the long-term projection, to simply retreat from those low-level parts of Invermay and Inveresk now, or at least have some forward planning that that is what you are going to do, rather than trying to protect them with levees and have developments that are sitting on piers and so forth? Do you have a comment on that?

Dr ELLISON - As everybody knows, Tamar to Launceston is a coast so a coastal engineering structure is proposed - the levees. It is a very quiet coastal environment; it is one of the quietest we have in Australia. Like Venice, if there are cultural heritage issues then levees could be looked at. It would be on a cost-benefit analysis, but given the future projections then maybe a long-term alternative could be looked at. It is less active

than other parts of the Tasmanian coast which will see more dramatic change. It does have problems with where it is. I don't want to be black and white on that one because I think there are so many sides to relocation. It is a possibility for Invermay but levees are also a possibility.

CHAIR - Thank you very much.

THE WITNESS WITHDREW.

Mrs ELIZABETH HALL, WAS CALLED, MADE THE STATUTORY DECLARATION AND WAS EXAMINED.

CHAIR (Mr Hall) - Thank you for coming along, Elizabeth. We have your written submission. You have a property at Waterhouse in the north-east and you have been doing some quite interesting work there, it would seem, over the years. I invite you to tell us about that and then we will ask you some questions.

Mrs HALL - We currently operate a property that bounds the Waterhouse Conservation Area. We have major problems with inland sand dunes, not coastal erosion as such. Lands department crews have worked since the 1950s to stabilise the coast land area of the north-east coast. Has sea level stabilised over so many hundreds of years or has it been an ongoing problem? It is not just sea levels; it is wind erosion and all the problems of mobile sand dunes and erosion.

We have lost acreage from an inland dune which is currently encroaching onto our property. I have a front-end loader presently working there, carting sand off paddocks and pastures so that a centre-pivot irrigator can swing. The sand dune itself is on the western end of the Barnbogle golf course. I do not want you to forget about us out there. We own the land, we pay the rates and we pay the interest on the place and we are trying to make a living. We have done lots of Coastcare programs - fenced off remnant vegetation and looked after native species as much as we can. However, the sand dunes are coming in at tremendous rate and our viability is at stake if we cannot do something with it. We cannot afford to lose more ground all the time. You say to stay off the sand dunes and fence them off or whatever, yet there has been so much money put into, say, the golf course, which is in the marram grass and which was planted by the Lands department. It is a really great tourist attraction and creating so much employment and interest in the north-east. So it is a difficult situation. I just wish the winds would come from the east and then they would blow it all back towards the sea or back down that way. It is the westerly winds that cause us the problem.

The inland dune that is encroaching onto us was never addressed by the Lands department. The coastline was stabilised but the owner of Barnbogle at the time did not want this dune addressed because he believed there were minerals and things in there that he would mine. So this one great big dune, which has a one-kilometre front and is definitely eight and perhaps 10 kilometres deep, is coming fair at us. There has never been mining on it. It is partly on crown land and partly on private land and now coming onto our private land. We have spent a lot of money over several years. We have had government intervention when we implemented a plan between ourselves and the State Government. Mr Green was one of the ministers and Mr Llewellyn was the other. They supplied government equipment and we planted it with marram grass simply because no-one knows anything better to plant it with. It is introduced but the native seeds, such as spinifex, stipulosa and different things, cannot stabilise the sand as a primary stabiliser. They can be introduced later, which I have done. I have sprinkled spinifex seed and boobialla seed and lots of native vegetation. They are all growing now and will come in and crowd out the marram grass. But they do not have enough strength to stabilise the sand because up there on a windy day it is just cruel. It is just like being sand-blasted.

What we have addressed over the two years is just phenomenal. Tania is going to come out and have a look. I do not want the Government to forget about us because primary production is really not that great at the moment - especially living there on your own, as I am. It is hard work. I am out there and I have a magnificent property, which I do love, and I want it to be there for my children to continue on. However, if the sand dune keeps coming in, it will not be. It will be gone.

CHAIR - Are there any other examples of these inland mobile dunes in the north-eastern area?

Mrs HALL - Yes, very much so.

CHAIR - Further to the east of you?

Mrs HALL - Yes; Waterhouse Lake and Little Waterhouse Lake are both being encroached with sand. There are Ramsar sites out at Little Waterhouse Lake which were planted originally to try to save them. In many places, as with everything, maintenance is necessary to keep things in order and that has not happened for years now. Even the tracks out to beach, which have always been maintained for firebreaks and different things, are not maintained anymore. If a fire ever started out there it would cause devastation. There is something like 20 000 acres of crown land on the north-east coast. Some of it is stabilised and some of it has broken out and other parts have never been addressed. The majority is good. There are lots and lots of native animals and things out there. That is another story. It is very diverse. It has a lot of different habitats and things.

CHAIR - I was quite intrigued when I read your submission because, quite frankly, it was something I had not realised existed before. I'd like to come up and have a look myself just as a matter of interest.

Mrs HALL - You could say to me, 'Fence off your areas and keep them safe', but Barnbogle is a perfect example. Even though the marram grass is an introduced species, is it so wrong to use it if it can stabilise a problem? Look at the money that has been put into just that one tourism attraction; it is incredible. The north-east generates money through potatoes - I grow potatoes - and beef cattle and different agricultural produce. It is a beautiful place. The sand is a natural phenomenon, I know. Some people say it's just an amazing natural phenomenon, and it is too, but I don't really want it to take me out.

Mr BOOTH - Is this mobile dune being replenished from stuff from the ocean?

Mrs HALL - No, not anymore. The coastline itself is stabilised; it just piggy-backs over and over itself. I have talked to men in Works department crews because I hoped that the golf course would help stabilise it, but they said that sometimes, because it is being looked after and maintained, it might create more problems because that will stay beautifully stabilised and the rest will speed up. The wind erosion comes over, gathers it and it just keeps coming over.

Dunes are amazing to watch. They will build up to a front, like a cliff face we saw on the beach, and they could sit there for years. But then one windy season or one windy

week and they can just flop down. I have seen them cover 20 metres in two days, because we had to move things again. We have moved the boundary fence about five times.

Mr BOOTH - You say there's a lot of these mobile dunes around the north-east. Have any of them been stabilised successfully that you know of?

Mrs HALL - Oh, yes. The whole coastline itself in part has been stabilised, and we stabilised one inland dune in 2003. With government help, my husband and I bought the equipment from the Government, the Landcare equipment. The Government provided the bulldozer and stuff, and we supplied the labour. We went to the marram grass nursery at Blackmans Lagoon, and we planted the whole dune ourselves over two six-week blocks. You do it in the winter time. We stabilised this one great big dune and it is holding firm now. It is amazing. Then the birds bring in the boobialla and they plant the seed in the marram grass. The pH of the sand dune is incredible; it has a really high pH so germination is good. The boobialla just grow with the ground covers and then the birds and the snakes and all those things come in.

CHAIR - A high pH in the dunes?

Mrs HALL - Yes, the sand dunes have a high pH, apparently.

CHAIR - Really. I am surprised. I thought it would be low.

Mrs HALL - No, it is meant to have a high pH. Old sand dunes have a really high pH. They are about 7 or 8, something like that.

CHAIR - Okay. You could grow poppies on that.

Mrs HALL - We have over the years, but mainly potatoes. Some people do actually spread the old sand dune sand on their paddocks because it helps with the pH. The mobile dunes have a salt content, though; it's the older dunes that haven't. You know we have experienced a drought, but you could go up on the sand dunes last year and dig down and there'd be moisture. How could it hold moisture? But the top half would be dry and that's what blows.

I've got a huge folder at home. I have put in for NHT and Coastcare fundings right back to 2001. I have letters that I wrote to Mr Warwick Smith - that's a long time ago - requesting help. It wasn't until Mr Llewellyn and Mr Green helped us out that we managed to do something with this one huge dune, but then there was this other one. There are other areas and many other farmers - I have letters here from all of the farmers around Waterhouse saying that they all have had or may have trouble with the dunes coming in. It is a management thing. Everything has to be maintained, otherwise it erodes and takes off again.

Mrs RATTRAY-WAGNER - Elizabeth, thanks so much for coming along today. It is a really interesting story and obviously there will be some implications if something is not done in the future. Talking about the maintenance of a dune, whether it could be revegetated -

Ms HALL - Yes.

Mrs RATTRAY-WAGNER - are the ones that are already there virtually maintenance free?

Ms HALL - Yes. The ones that have been stabilised are virtually maintenance-free. The boobiallas and the native vegetation come in and they take over. They actually choke out the marram grass. It is just that if there is a bit of a vulnerable area the wind will get in and then it will tunnel out and the erosion starts. It is not because of the sea because the bands sort of stabilise around the coast - in the north-east at least - it is more wind erosion that causes it plus the native wildlife and different stuff.

Some people will say it is caused by stock and people but the Aborigines were out there all those hundreds of years ago. You cannot stop public access to everywhere because there are so many campers who love to go out there. I don't believe that stock cause a problem because you have to have boundary fences, otherwise you lose your stock. Even though they are not worth a great deal at the moment, you cannot afford to lose any. So I do not believe that any stock are grazing the marram grass because you would lose them, you would not get them back - not with the acreage we are talking about. You would be surprised at the amount of land that is out there. I invite you all to come out and have a look.

CHAIR - That is something we might well organise, yes.

Ms HALL - I would love you to come; I really look forward to it.

Mrs RATTRAY-WAGNER - I would even host them for the day.

Ms HALL - Would you? I could put them to work because Mr Booth is wearing blundstones, I notice.

Mr GREEN - With the dune we are talking about now, you are still having encroachment? You said it moved 20 metres.

Ms HALL - It is still encroaching right on the edge of the one we have planted. That is where I am having the sand removed at the moment for cropping purposes. But the dune frontage has stabilised. It is good.

Mr GREEN - So the work you did in 2003 worked?

Ms HALL - Yes - the work we did in 2002-03. We sort of did it backwards. We started at the edge of the dune and planted down towards the sea and that was six weeks worth of work and then the next year we went from where we finished right to the coastal stabilised side.

Mr GREEN - Has there been any further resistance to your wanting to plant marram grass?

Ms HALL - No.

Mr GREEN - So you are okay to plant it then?

Ms HALL - Oh no, the department would not allow it. There is no equipment or anything available and no works crew in the north-east now.

Mr GREEN - If you wanted to do it as an individual would you be able to do so?

Ms HALL - If I could fund it myself I guess I could, yes, but I do not think I could afford to pay a bulldozer at \$100 an hour and a driver.

Mr GREEN - What happened to the dozer though?

Ms HALL - It was sold at a government sale eventually. I did hear it was sold originally at a very reasonable price and later it was sold at a huge price so somebody made a lot of money.

I thank you for your help because if we had not addressed that problem I hate to think what it would be like now. I say that my children have the biggest sandpit in Australia, I am sure, because it is humungous! If you come, do so in autumn or winter, because in summer it is a bit dry and very snaky.

Mr BOOTH - So currently this dune is actually on your property?

Mrs HALL - Yes.

Mr BOOTH - Totally - in its entirety?

Mrs HALL - No, it has a 10-kilometre depth, so it runs right back to the cut at the Forester River.

Mr BOOTH - So partially on your property?

Mrs HALL - Yes, and partly on Barnbogle and partly on Crown.

CHAIR - Thank you very much. That was a very interesting submission and another perspective from a landowner's point of view on obviously a fairly fragile part of the coast. I think a site visit by the committee would be in order and we will get in touch with you about that soon.

Mrs HALL - I would appreciate that.

THE WITNESS WITHDREW.

Mr BRIAN AND Mrs ALISON HEATHORN, WERE CALLED, MADE THE STATUTORY DECLARATION AND WERE EXAMINED.

CHAIR - Welcome to these hearings this morning. Thank you very much. We appreciate you have come quite a way from Circular Head. We have your submission, in which you talk about the Detention River-Pebbly Beach area and obviously there are some issues there which you would like to expand on to the committee in regard to houses and shacks in that area. I invite you to do that for us and then we will ask some questions.

Mrs HEATHORN - Before we start, I made a CD, which focuses on the time between 2003 and 2008, and shows you the difference between 2003 and 2008 and the amount of coast that has washed away. You can keep that. I did try PowerPoint but the photos were a bit big in it.

This is the area we are talking about. The area with little red crosses is Pebbly Bay - that is the area we are talking about. Over the last five years the river has moved in towards this area, while before it used to be on that area. So basically the river shifted and because of that the shape has changed.

Mr BOOTH - Is that only in the last few years you are talking about?

Mrs HEATHORN - That is the last five years. That is an aerial photo taken back in 2004 when we flew over it. This is how it used to be with a lot of vegetation shaping the front. And this is what it is like now.

Mrs RATTRAY-WAGNER - And that's in five years?

Mrs HEATHORN - Yes, in five years.

Mr HEATHORN - Moreso over the last two years - that is when we've really noticed it. Prior to that it was perhaps a little, but in the last two or three years it has really got going.

Mrs RATTRAY-WAGNER - Has there been a lot more human traffic in those last two years?

Mr HEATHORN - No, I wouldn't think so.

Mrs HEATHORN - It's more the easterly winds and the high tides.

Mr BOOTH - Much boating activity?

Mr HEATHORN - No, not much boating activity; in fact probably less now than there was before.

Mrs HEATHORN - Yes, there's less. That's the amount of beach we used to have and the vegetation - that's what used to be there. This is what it is like now. All those trees you can see in the top corner are now all in the water, so that's all washed away. This was the

beach we had in front of our house in 2004 - all that sand and the river was away over there.

Mr HEATHORN - The channel has probably moved the best part of 250 metres from the east side of the river to the west side.

Mrs HEATHORN - That is where the path used to be, where you would just walk out. This is what's left of it, and it wasn't us, but somebody has put some steps there now, and you actually have to go down those steps to get to the beach.

Mr BOOTH - Do you know whether that river channel has been moving over the last hundred years or so?

Mrs HEATHORN - It does move, but it's got really bad. If you talk to local people, you will find that it's got really bad, especially over the last two years.

Mr HEATHORN - The channel's sort of moved a bit all the time, but this last three years it has come right over on the western side and it doesn't look like it's going to move from there, but it's getting very close.

Mrs HEATHORN - The sand has actually come back a little bit. Before the steps were just sitting on the sand, but this last week we noticed there was a little bit more sand come back. But there is still a big drop there, whereas before you just used to walk straight out. This is the deck we used to have there up the front, and that's where the deck was, so there is where the back of the deck was, and all that front is just washed away. There was a lot of vegetation in front of that, now it is back in here now. This is how it used to be - that was the beach and that's actually our house there. We used to be able to walk straight in there. As you saw before, there is that big drop with steps which gives you a bit of an idea of how much has been washed away.

Mr GREEN - How far is that drop from the front of your house now? How many metres from that point to the front of your house?

Mrs HEATHORN - We are still on crown land, so there's still about - how much would you say, how many metres left there?

Mr HEATHORN - Six or seven metres, probably.

Mr GREEN - Oh, yes. Not much.

Mr HEATHORN - No, not a lot.

Mr BOOTH - That's before your boundary or your actual house?

Mr HEATHORN - No, no - to our boundary.

Mrs HEATHORN - Title boundary, but then what we call the sand dune, it goes down fairly quickly.

Mr HEATHORN - Yes. Once you get to the boundary down into our place, it goes like that, so of course once it gets to the boundary it's virtually in the back yard.

Ms THORP - How long ago did you get building approval for your place?

Mrs HEATHORN - We didn't build there. That house was built in 1993.

Ms THORP - So it's a fairly new house?

Mrs HEATHORN - Yes.

Ms THORP - What council was that?

Mrs HEATHORN - Circular Head Council. It was the Government actually but it used to be on crown land and they allocated those blocks and they were sold.

Ms THORP - Is this part of the shack-site stuff, Bryan?

Mr GREEN - No, that was prior to the shack sites. Detention has been freehold for some time, hasn't it?

Mrs HEATHORN - Yes. Those blocks came up, I think, in late 1989. I'm not exactly sure whether it was 1989, and then it was built on. This house was built in 1993.

Mr BOOTH - But it was government land?

Mrs HEATHORN - Prior to that it was government land. This has been freehold. This gives you a bit of an idea.

CHAIR - Thank you, that was interesting. A picture paints a thousand words sometimes.

Ms THORP - As local residents you'd know the area pretty well. What do you put this erosion down to? What do you think is the cause?

Mr HEATHORN - We have had a lot of easterly wind, which hasn't helped. When you get easterly wind it pushes the water across this side. We also have noticed higher tides; the tides are definitely higher because otherwise it wouldn't get in there.

Ms THORP - So stronger weather events with the easterly winds and higher tides?

Mr HEATHORN - Yes.

CHAIR - Would you like to add some more to that submission, Mr Heathorn?

Mr HEATHORN - I'm not sure what you do with it. I thought an exercise that could be worthwhile would be to put two excavators on the beach, dig a channel back where it used to be and see what happens.

Ms THORP - How many houses are going to be affected by this?

Mrs HEATHORN - Initially there would be three houses affected, or three owners. Once it gets to our place, the middle section of Hellyer is shallow, it is lower in the middle and then has some more dunes across the Bass Highway. That is why we like to be proactive. It is bad enough for our house to wash away, but once the water gets in there it will go right through the main part of Hellyer. I am not exactly sure how many families it would affect but I think there are around 70 houses there, but don't quote me on that.

Ms THORP - Have you ever had a conversation with your insurance company as to their attitude and what should happen should you be inundated?

Mrs HEATHORN - No, but I did look up the policy and they call it an act of God, so you are going to lose your place, in other words. There is nothing. I haven't talked to them but that is how I understand it.

Mrs RATTRAY-WAGNER - What about a conversation with your local council? Have there been any proposals or discussions?

Mr HEATHORN - We had heard nothing back from this committee when we first wrote to them, so we met with Daryl Quilliam, the mayor. He came out and had a look. He obviously wrote to the committee because he said he had had information back. The next thing we knew this committee was being held.

Ms THORP - I don't recall any correspondence from the Circular Head mayor.

CHAIR - No, I don't recall any at all.

Ms THORP - The only reason we have taken a long time is we have had other things we had to clear up first.

Mr HEATHORN - That's why he didn't get a letter to come today, probably. He said he had made contact with someone. We gave him a copy of the letter that we had.

Mrs HEATHORN - The very first letter, when it was advertised in the paper. But the last two letters have said not to talk to anyone so we haven't done so. I haven't got back to Daryl because we weren't supposed to.

CHAIR - Seeing as we haven't had any correspondence, we will follow that up.

Mrs HEATHORN - Not long after we had Daryl out there we got this letter from you about this meeting, so I assumed that Daryl had been in touch with you.

CHAIR - No, the secretary is shaking his head.

Mr BOOTH - In terms of the history of the vegetation and the dunes that have collapsed, presumably they have been washed away, have they?

Mr HEATHORN - Yes.

Mr BOOTH - On high tides that is what seems to happen?

Mr HEATHORN - Yes.

Mr BOOTH - So a storm event has taken them out or just a high tide?

Mr HEATHORN - I do not really know. With high tides, the water gets right up and of course with a little bit of wind the water slops, and that sand is so free it just works its way out. Once it gets in the channel of course when the tide goes out it is gone.

Mr BOOTH - Yes, thanks. What I am trying to find out from you is if you understand there has been any mechanical damage to the dunes through -

Mr HEATHORN - No, no. No, I do not believe so.

Mr BOOTH - Right, so it is entirely a result of high tides or high seas?

Mr HEATHORN - Yes.

Mrs HEATHORN - Yes, definitely. There are no more people there, and people couldn't walk past where we are because there was too much vegetation there. They always used to walk on the beach. They used to go on the street and then go down the sand, come on the beach and then come back up, so they never really walked there.

CHAIR - Is it the norm for you to get many easterly winds down there or is that more abnormal? We have had a couple of drought years, dry years. Do you think that has been connected with more easterly winds than you would normally get?

Mr HEATHORN - No, I would not think we have had any more easterly winds than normal, but the fact that the channel has come across means that we do not need any winds to cause a problem.

CHAIR - But didn't you say earlier that the easterly winds were -

Mr HEATHORN - Oh yes, the easterly wind has not helped it. If we had all westerly wind it would tend to keep it away. But I do not know that we have any more, just the fact that the channel has come across, right across to the bank, and with higher tides, of course the water slops on the sand with the wind bringing it this way. It is the last thing that has caused it I think.

Mrs HEATHORN - I do not know whether you have any submissions about Stanley but the east inlet at Stanley is in the same situation.

CHAIR - I was going to ask if there were other spots along that strip.

Mrs HEATHORN - The east inlet at Stanley is the same. In some places it is getting very close to the houses.

Mr GREEN - There have been houses built closer to the dunes there, haven't there, but originally if you look at the old photos of Stanley, the water was effectively right up to

the railway line which ran parallel to where the road is to the lookout; the water used to effectively come right up to the lookout at the Stanley Nut.

Mr HEATHORN - Really?

Mr GREEN - Yes, many years ago, so it has actually gone the other way as dunes formed there.

Ms THORP - Have you given any thought to what potentially could happen should this process continue outside your home? If you are looking at 6 or 7 metres of coastal strip or coastal reserve left and then it is on private property, how are you thinking?

Mr HEATHORN - If it keeps going like it is, it will eventually go straight down the middle of the street.

Mr BOOTH - Isn't there a bit of a hump in front of your property?

Mr HEATHORN - Just a little; it is not a lot. We are not talking about much of a bank.

Mrs HEATHORN - But the hump is washing away. It has not got that far to go before it is through the hump.

Mr BOOTH - How high above sea level would the average height of your house be?

Mrs HEATHORN - No, our house is down low. They dug it out when they built the house - it is a two-storey place - there is the dune in front and then it goes down to the sea, but the dune would be more than 2 metres high, I would think.

Mr BOOTH - In terms of the high-tide level, would your ground floor level be lower than the high tide?

Mrs HEATHORN - No, it is higher than the high tide. I reckon we would have a couple of metres still.

Mr HEATHORN - Because the high tide washes in against the bank, of course it just washes away there and next thing plonk, it all that falls down, which of course washes that out when the tide goes. Then the next tide of course washes a bit more under there. It is just like an excavator digging it out underneath. Of course eventually what is on top is going to fall straight in.

Mr BOOTH - Has there been much of a change in the river flow?

Mrs HEATHORN - All the sand has gone to the other side of the river. The sand is still there but instead of being on our side, it has gone to the other side.

Mr BOOTH - I was just wondering if there had big storm events or something?

Mrs HEATHORN - No.

Mr BOOTH - So it seems that most of the erosion is coming from the sea rather than from the river doing anything different than it used to.

Mr HEATHORN - I would think so.

Mrs HEATHORN - Yes, definitely, because in front of ours on the crown land, as you saw in those photos, there was heaps of vegetation. People could not walk there because it was too rugged, and still it is washed away.

Ms THORP - It must be very concerning for you.

Mrs RATTRAY-WAGNER - Has there been any attempt by yourself or a community group to put some vegetation back onto some of those areas and try to make it a bit more solid and a bit more permanent?

Mrs HEATHORN - The vegetation that was there has all been washed away. It is all gone. There used to be a lot of vegetation. There was about 2 or 3 metres of big, high vegetation. But it has all gone. It has just been washed away, trees and all. It did not make any difference.

Mr HAWTHORN - At present, I do not think you could put anything there because the water is washing it out as fast as you put it there.

CHAIR - The committee, through the secretary, will ensure that we contact the Circular Head Council and talk to the mayor about some of those other issues that you had there so that we have a handle on that.

Mr BOOTH - Where do you think the responsibility lies with this in terms of addressing your problems? Do you have an opinion on that?

Mrs HEATHORN - I think it could be a combined effort between State, council and owners. The best solution would be to put a rock wall up but there are only three people who are directly affected at the moment and two of those people say they are not really interested and they are very blasé, they are not concerned. They think it is gone and it will come back again. Brian and I are probably the only people who have expressed a lot of concern about it and people have laughed at us. But I am concerned about it. I would rather see something proactive happening than see our house washing away. We bought it when it was cheap so we would not really lose that much if we lost it. So I am not totally emotional about it, if you know what I mean. But it is going to affect the whole community. A proactive thing would be either putting a rock wall up, which is expensive, or, as Brian said, try the drain-digger approach. That probably would take one day with two diggers, just in case one did get stuck, to pull the other one out. You are looking at not a lot of money and it would change the course of the river back to where it was. That would be the cheap option as a trial. That is all I can really suggest. That is proactive. But if you are going to leave it, once the bank in front of our house is gone -

Mr HEATHORN - Then it is a bit late.

Mrs HEATHORN - It is too late because, as I said, it will go right around through Hellyer.

Mr BOOTH - You are saying it is mainly wave action that is bringing it down so how would shifting the channel help that? Won't you still get the high tides and waves running in it? It seems to be further up the beach.

Mr HEATHORN - When the tide goes out, because the channel is right at the bank, that rush of water takes everything with it. I think the channel should be back on the other side where it used to be, because we never had any trouble until the channel came across.

Mr GREEN - You were on the shallow side before but now you are on the deep side?

Mr HAWTHORN - Now we are on the deep side.

Mrs HEATHORN - When we bought the place seven years ago we were able to walk straight through the front to the front beach, while now we cannot even get there.

Mr GREEN - I know exactly where you talking about because I fished for salmon right in front of your place and that was always the shallow side. So the channel has shifted right over, obviously.

Mr HAWTHORN - Even on high tide little children could come out and play on the beach in the water because it was not very deep. It was like a lagoon type of thing. But now, no way could you do that.

Mr GREEN - It is a bit like the Emu River which used to flow directly from the bridge straight to the sea and now it comes under the road bridge, turns lefts and goes along the beach about 80 metres before it then runs out to sea. The channel has shifted and it is not too dissimilar to what you are talking about here.

CHAIR - Mr and Mrs Heathorn, thank you very much for your contribution this morning. We appreciate the fact that you have come up from the far reaches of Circular Head. We will provide feedback.

THE WITNESSES WITHDREW.