NEW SOUTH WALES STATE CORONER'S COURT

STATE CORONER: J ABERNETHY

FRIDAY 17 MARCH 2000

5/98 - EVENT OF THE 1998 SYDNEY TO HOBART YACHT RACE

INQUEST INTO THE DEATHS OF JAMES MICHAEL LAWLER
MICHAEL BANNISTER
BRUCE RAYMOND GUY
PHILLIP RAYMOND CHARLES SKEGGS
RONALD FRANK MATTHEWS
GLYNN RODERICK CHARLES

Mr A Hill assisting the Coroner
Mr R Stanley with Mr P Santamaria for the Bureau of Meteorology
Mr R Weber for The Cruising Yacht Club of Australia
Mr Morahan for Mr Richard Winning

PART HEARD

<CHARLES ROGER BADHAM(10.08AM)
RESWORN, EXAMINATION CONTINUED

HILL: Q. Mr Badham, when we left off yesterday afternoon you were given two charts and the reason for that was--
A. My homework.

Q. Yes, for some homework. Basically it was because you said that on the afternoon of 26th, some hours after the race, you realised about the storm warning, that you could actually forecast at that point in time where there would be tumultuous seas and weather. Is that correct?
A. That's correct. When I say, on that afternoon I had gone through the motions of looking at the charts and figuring out that that's would occur, particularly the current charts, that's the water movement charts. And then early the next morning I actually ran through all my algorithms, I think it was about 5 or 6am in the morning I actually ran them to see what the numbers would produce.

Q. How long would it have taken once you had the storm warning, how long would it have taken you to actually sit down and work out everything?
A. That assumes of course that the model winds are correct, so you take the model output winds, you look at the oceanographic currents, you put them together and you can come up with, physically you input the winds into another computer, run them, that takes about half an hour, an hour, and you import the stuff, look at it and then adjust them and add in the currents, virtually manually I had to do it. So yeah, about an hour.

Q. If I can put it this way, if you had had or if anyone had had with your abilities the storm warning at 2 o'clock,

you would have been able to predict and forecast where there would be areas in the fleets path which would best avoided if possible?
A. Yes, well it is not actually the storm warning, it's the model output winds that you want.

Q. The model output. That would have been able to be predicted and that would have been able to be forecast?
A. Yes, yes it would. Unfortunately at the moment the standard models that are run by the Bureau of the standard oceanographic models predicting wave height, do not take into account the currents. Now that's the sort of work that's being done at the moment by Professor Leslie and those sort of people, will I'm sure sort of push into that area now and so - I mean a good wave model must take into account the water movement just as much as the wind stress on top. And if you don't take into account both, then you know obviously something is lacking in the equation.

Q. The result is, if you had been asked to do that say at 2 o'clock on that afternoon, the Saturday afternoon, to be able to tell us where the winds are most likely to strike as it were, and where the seas are likely to be most treacherous, by what time would you have completed that?
A. As I say, it'd take me about an hour to do. And in actual fact I could have run them on the - in fact what I intended to do that morning before I went to the CYC to brief my yachts, was to actually do that with the run from the AVN model, that's the US model where I had the, I can actually get the grid file of winds and then run those across. And I physically ran out of time, I just, the whole wave thing just ran out of time and when the model came in early that morning I looked at the winds and I thought they were probably excessive, because at that remember I thought that the lapse was probably the best solution. But anyway, the answer to your question, about an hour.

Q. You have marked the large chart, is that correct?
A. Yes I have, somewhere--

Q. This is the chart that you've marked, this is exhibit 4. Would you just have a look at that?
A. That's correct.

Q. I'm going to pass that along the bar table, then I'll pass it over to you Mr Coroner. And I will ask him to explain what those areas are, I'll just pass it along so that everyone is conversant with what I am talking about. That's the chart?
A. Yep.

Q. Perhaps if you would see it Mr Coroner, then we could hand it back to the witness. It's the pencilled areas A and B, is that correct?
A. No, there's a tiny little area C as well.

Q. There's a little tiny area C. Now the area A, what does that signify?

A. It signifies the reach and where the current was going to be flowing down in a southward direction. It had been estimated by the CSIRO before the start of the race to be 1 knot. And from my calculation with the northerly wind in the preceding 24 hours, which at some stage has got up to the mid 30 mean speed, maybe higher but certainly it was in the mid 30's, that that current would have increased. It probably pushed a little bit further south but I can't say that. But I know it was in that area because you could see it prior to the storm actually taking place. And the current prior to the actual strong winds or the gale force to storm force winds that went through that area, it's my estimation that the current there would have been at least 2 knots. Many of the boats that were out at the time, in hindsight, said that they were measuring up to 3 knots but 2 knots is sufficient to give you at least a 40 percent increase in mean wave height.

Q. That's in area A is it?
A. That's in area A, that's area.

Q. What does that translate into in plain layman's terms - case in wave height, what does that mean?
A. Mean wave height.

Q. Mean wave height?
A. Well, it depends what mean wave height you want put in the area. The VRO, as we call them, the Victorian Regional Office, they were forecasting 5 to 7 metre seas and that's what was observed at Kingfish B platform which is further to west. It would be my estimation that the waves that were probably flowing across in that area were probably 6 to 8 metres, then you add on the 40 to up to 50 percent. So, in other words, if you take 6 to 8 metres that's a mean of 7, 7 plus up to 40 percent you can add another, at least 3 metres. So in other words you're looking at 10 metre seas.

Q. In where?
A. In that region A.

Q. In region A--
A. Now not - it may not be uniform across that region A, there's still going to be little jets or elements within there where they could be worse and elements within there where it could be less than that. But that's a good, you know, good approximation as to where the waves would be larger. And I heard earlier this week someone described them as a washing machine, in actual fact you would find that the washing machine type seas would be particularly around the edges of these things and in fact in the middle of that, it's often not a washing machine, it's often quite a uniform set of wave trains with quite set periods but the things that is nasty about them is that the waves are significantly higher, that's the mean wave height is larger, but the wages are also shallower, that is that they have breaking fronts, breaking tops which topple of the front and they have hollow backs. And that's what makes them extremely hazardous to small boats. Even large boats. I

mean similar situations occur off the south east coast of South Africa where they have 3 knots or often 4 knots of current and they have the same sort of depressions that often come around there and they break the back of oil tankers. They sink them.

CORONER: Q. When they're running before those waves particularly I suppose?
A. Yes, when they're in the current which is running dead against the wave trains. It's probably the worst place in the world.

HILL: Q. So area A would have average wages of 10 metres, is that what you're saying?
A. Yes I would say that, at the peak of the wind and the wave train's coming the other way which would have been some time probably later Sunday afternoon.

Q. Do we then add on top of that the 86 percent for the rogue of king wages or whatever they want to call them?
A. The 86 percent comes to the 1 in 1000 waves. In actual fact what I said was that you set up these waves trains, in the core element of A you would find there's wave trains, I would imagine that the period of those wave trains is probably quite large, the waves are quite well spaced and you'd be battling on a normal wave rider boey(?) to count probably in a 20 minute period, you'd be battling to count more than, certainly a 100 waves would be probably excessive in that time period. So if you counted 300 waves an hour you'd have to theoretically, according to the statistical spectra, you would have to then wait 3 hours at least, maybe 3 to 4 hours, to see the 1 in a 1000 waves. So if you waited there in the worst time then maybe 1 in every 1000 waves or, it would 86 percent higher.

Q. I take it then that 1 in a 100 maybe what, 10 percent higher or something like that. How does this work?
A. Yeah I mean, it's a statistical distribution, that's what waves, you know, they are a whole set of conglomerate things that pad together to give you a mean which is, well there's actually a mean wave height but the significant wave height which was described the other is the two thirds level, which is what the observer would observe, and then there's statistical fluctuations above that, sure. And, you know, you could probably find a wave that was going to be a 100 percent bigger too, but you'll have to wait longer. And if you wait longer then maybe it won't even turn up.

Q. What we've got is evidence within the statements that have been taken that they would keep their eye out, that is the yachtsmen, for these big waves and then they would see a big wave. And this appears to occur every 20 minutes or so, is there any accounting for this or?
A. No, I mean it's very much a function of the whole situation as it has been set up and it's very dynamic and it is very difficult to predict. I mean wave trains in Bass Strait are amazing things, I've only observed them in a nasty situation, in fact only once I've observed really

nasty wave trains. I try and stay on the land and forecast for people at sea and not do it the other way. And in this situation the thing that is important or that's relevant is that the actual low was moving from west to east in phase with the actual wave development. So the waves are actually getting the energy input into the situation is in phase during the whole of Sunday, so from, virtually from late Saturday night, almost over a 24 hour period, the waves and the wind are moving across from western Bass Strait into eastern Bass Strait and the wave energy is getting larger and larger.

Q. And that's what strikes the northern current?
A. Yes.

Q. The south flowing current and the wind of course?
A. Absolutely. Yes.

Q. You've also marked an area B on that. Perhaps you could hold that up and just point to that area?
A. Yes, area B, which is here, which was also where there was adverse current but that was much less so and my suspicion was then and still is that that area, although the waves would have been larger in that area, they probably would have, the adverse current would have been washed out by the presence of the strong westerly's within a certain number of hours. So in other words, I mean the whole area would have been pretty horrendous given that there were probably 6 to 8 metres waves generally but there would have been washing machine and nastier conditions in that area to start with but they probably would have washed out. And area C that I also described up here was right in on the shelf, in fact past the shelf, right in on the coast, virtually from the back of Twofold Bay, all the way round the coast to, probably around to Mallacoota. There was also in that area some adverse current but that also would have been washed out in the first, probably may be 6 hours or something like that. So in other words - but this area, the A area, would have in fact, even with the satellite photographs after the storm had gone, the adverse current was still there. So in other words that area was probably there for the whole duration of the storm.

Q. You say that you could have forecast those areas there about an hour after 2 o'clock on the Saturday of the race day, 26th?
A. Yeah. Yeah I think anyone that put together the waves and wind scenario would do that.

Q. You've marked one of the other maps, one of the charts there, and perhaps if you show it first of all to the bar table and the Coroner, it's that particular one, I think it's got a map number up in the corner?
A. Map number 5.

Q. These are the one that I handed out before. And you've drawn an area--
A. That's roughly equating to area A. Unfortunately

there's, the lat and long's here are not easily marked in and I did them with a ruler, just sort of working them out roughly where they were last night, so that I could map in this area A again as well as I could. But it's, you know, it's probably give or take at least 5 miles or something like that.

HILL: Those charts I think have been tendered but I will tender this one as a different number.

EXHIBIT #11 MAP 5 EPIRBS TENDERED, ADMITTED WITHOUT OBJECTION

CORONER: Q. That again basically shows area A Mr Badham?
A. Yes, that's correct.

Q. What do you say about the area between area A and area B?
A. There was an adverse current there so therefore the waves would have been just as predicted by the wind stress models, which would be, as I say, I would have thought probably 6 to 8 metres significant wave height.

HILL: Q. Do I take it that what you're saying is, the Bureau's forecast doesn't take into account the currents?
A. I don't think so. I mean you'd have to check with them but I don't think so.

Q. But certainly you do?
A. Ah, well I do when I can and in fact for the forecast that I did on that day, I actually had a spread sheet done which I went through with some of the boats I never actually got to do the proper prediction. But I do, I mean it just depends on the event and what you're doing. I mean it's another complicated facet and you need time, you know an hour of your time and fortunately in forecasting time is often of the, you know, utmost precious commodity and you don't often have time to do those sorts of things.

Q. If you could go to page 20 of your statement, and you say there that it was reasonably obvious particularly later Saturday that there it was going to occur. That's the storm which you're talking about?
A. That's correct.

Q. I conveyed that message to Mundle, that's Rob Mundle is it?
A. Yeah.

Q. Now he's a journalist?
A. That's right.

Q. He was in the ABC helicopter was he?
A. No.

Q. No he wasn't, where was he, any idea?
A. I've got no idea. I caught him on mobile, he was in Sydney somewhere. As I said yesterday, the only reason I

caught him was because he'd called me and that on the morning and the days preceding to the start.

Q. You say 'I remember talking to him that Saturday night then again on the Sunday morning'. And you actually talk about, saying that 'particularly in that little area where currents were going to be directly opposing wind and the sea, there was going to be some particularly nasty conditions and that was probably where the yachts would break up and there'd be a lot of damage and a lot of withdrawals'. That's the areas that you've marked there is it?
A. That's correct.

Q. Then you were asked this. 'When you saw what you felt was going to happen, did you inform the CYC or did you inform them of what you thought was going to happen', you say 'not at all'. 'I suppose you don't in advance think it's going to be that bad', 'It's not my role'. Is that basically it, why you didn't inform--
A. Well I, it just wasn't my duty or function to, I don't have a working relationship with the CYC as such. I mean I, the current race director Phil Thompson, or Peter Bush or any of those guys, I don't have a working relationship with them.

Q. Do you know them?
A. I know Phil, I don't know the others really, to any great extent, no. I mean that's, it's, I mean it wasn't my responsibility to do that. I mean, I'd seen the warnings, I've seen the forecast come out from the Bureau, they were certainly, you know with the storm warning out. They were, in fact the forecast from the Bureau were probably more comprehensive on the Saturday than they might have been on the Sunday but they were certainly covering the situation and so I presume that everything was working.

Q. Well that's what, you say that. You say, and this is the top of page 21, 'I imagined that the CYC probably had lines of communication available between the weather bureau who were doing the forecasting themselves, so I would imagine that the race director was probably on top of what was actually occurring'. That was what you thought?
A. Yeah, why not?

Q. You then go on to say this 'I did the forecasting for the race back in the last 80's and early 90's and I used to talk to the director of the race, Greg Halls or Mike Fletcher, all those guys, if there was anything that was untoward and I would imagine that the same lines of communication were there' - and I presume you're saying at this race?
A. I assumed that. I mean it's a surprise to me that it wasn't quite that way. But I assumed that they were as, when I did it, that they would, the same sort of thing.

Q. What was the situation when you did the forecasting and Mr Halls, Greg Halls or Mike Fletcher were the race

directors, what--
A. Well it's, I mean forecasting is about communication. I mean you obviously have to get the product right because if you're going to tell someone the wrong information then you're wrong. But if you have the situation basically correct, it's no use unless you actually tell the person what it is and you've got to have, it's got to be good communication because the person who you're or your client has got to understand the situation in the forecast as clearly as you have. And that's communications. And in that situation, I mean going back in those days, that was before Satcomseas and fancy satellite delivery of information and in fact it used to be difficult to contact the Young Endeavour - it wasn't the Young Endeavour then, it was one of the other yachts that they used as a relay vessel. And it was, I used to often patch in, I mean I would fax the forecast in those days to the CYC and it was up to the CYC theoretically to get that forecast to the relay vessel. But often times I would contact the relay vessel myself, especially if there was any weather and I would actually read them the forecast direct to the radio operator or I would, and I would actually give him a few observations. I'd say look, you know, that's 35 knots at Gabo Island or whatever, you know, give him the actual reading, highlight that or whatever. It's a communication, that's what it is about.

Q. So that's what occurred when you were doing this and Mr Halls or Mike Fletcher?
A. Yes.

Q. You were, what, you presumed that that was what was occurring now, did you know?
A. I didn't really know, I just assumed, I mean I, I didn't know.

Q. In fact you talk about what you did when you were forecaster for the CYC at pages 21 - 22. You were asked this question at page 23, question 51, 'Just on that do you feel that if it should have been the club's informed opinion to relay pertinent information to yachts in relation to weather', you say 'Well I think that's definite, I mean it's their obligation to try and do that but at the same time they've contracted the Bureau to do the forecasting, so therefore the forecast that comes out from the Bureau should convey that information. So therefore if the forecast is correct in detail then that should be sufficient'. In light of that - you still stand by that?
A. Yeah, absolutely.

Q. In light of that I want you to have a look at the Bureau's information that was given to the fleet. Unfortunately this isn't paginated but we will paginate it over the next period of time, it's a Bureau of Meteorology New South Wales Office, it's an updated, issued by the Bureau, updated at 1450 on Saturday 26 December 1998?
A. Yep got that.

Q. You've got that? That is the one that's gone to the Young Endeavour?
A. Mm-mm.

Q. What's the first point that you want to make about that, working our way down from the top of the page?
A. I would say generally that the, and I don't know whether to just take this forecast or take the few of them as they follow, I mean the only pertinent forecast really are that one and the next three probably, in other words the one that is issued that afternoon, no the next two. There's one that's issued that afternoon, there's one at 2am the next morning and then one that is issued at 2pm the following afternoon. After that's happened.

Q. Let's deal with this one first, this is the one at 1450 hours?
A. Yep. It gives you a synoptic situation which, in my opinion, does not describe what is going to happen. It says 'a low 995 near Lord Howe Island is slow morning'. What's that got to do with the fact that there's going to be a low develop in Bass Strait and following 12 hours and is going to be 980 something with 40 to 50 knot winds according to the models.

Q. Right?
A. A cold front over Central Victoria. So they don't reference anywhere there the low that's actually going to do the damage.

Q. I noticed that, it goes on then and says 'warnings - storm warning is current south from Merimbula'?
A. Yes.

Q. 'Gale warning is current south from Broken Bay'?
A. Yep.

Q. So we've got a storm warning?
A. Yes, and, you know, the storm warning is for winds, mean winds of above 48 knots, that's fine. Then the forecast is for very strong northerly winds of 20 to 25 knots, in actual fact they were strong than that but that's alright, that's a fair enough forecast. And ahead of the west sou'westerly change a 25 to 35 knots with strong gusts near Jervis Bay around midnight, winds tending briefly north west prior to the change and then the outlook for the next 24 hours gale to storm force westerly winds south of Jervis Bay expected to moderate Monday. So that's not really very descriptive, it's not pointing out to the people that there's this intensive low pressure system that is going to form, it's going to be 980 whatever it is millibars or hectopascals, it's going to have, the models at that time were showing 40 to 50 knots of mean wind speed, and yet there's no indication of numbers of 40 to 50 knots referenced anywhere there except that they do say storm force winds. So, it's communication.

Q. That's what I'm little bit uncertain of, I've got a

storm warning, and take it as understood that I accept that a storm warning will give me winds above 48 knots, right?
A. Well I know that but I don't think many of the yachtsmen knew that.

Q. Whether they did not, but the point--
A. But the point is it's there.

Q. --is I cannot see with the wind anywhere that get's me anywhere close to 48 knots?
A. No there's nothing there. And this is--

STANLEY: Perhaps I should voice my concern about this evidence. It certainly has the potential to be gravely misleading because your Worship will note that this forecast is given for a specific area and the area is noted as Sydney to Jervis Bay, and that is because that was what was requested and required under the contract by the Yacht Club. If your Worship looks to the contractual document that is in evidence you will see that that's confirmed. It is a specific product that's been asked for by the Yacht Club and it has been provided.

Of course it's a time when the storm warning for the area south of Merimbula has been issued and is current. So that we say this totally misleading evidence.

WITNESS: Okay--

CORONER: Just wait a sec Mr Badham, we'll sort this out with the lawyers first. What do you say Mr Hill, do you take that point?

HILL: I take the point except what I want to emphasis is this is from the documentation from the Weather Bureau. This updated at 1450 on Saturday 26 and this goes to the Young Endeavour. The next document - and it's got a storm warning on it, south to Merimbula.

The next document is at 0213 on Sunday 27--

CORONER: For some reason the other documents aren't in my copy. The next page is it?

STANLEY: I think you'll see them collected en toto at the back of the document behind another attachment, and that earlier on in that report are two or three of them together. I can put a tag in them if you like.

HILL: Yes you should be looking at appendix 5--

CORONER: Yes, mine only goes to - hang on, no it's two folders, it's alright.

Now the next one you're drawing my attention to--

HILL: It's a document that's updated at 1450 on Saturday 26. Directly behind that you will see a document, the same

style of document issued at 0213 on Sunday 27.

The point that I am making is that although the 1450 document talks of a storm warning, and it talks of a storm warning south of Merimbula. You don't get details of that storm until you go the document that is issued at 0213 hours on Sunday 27th.

CORONER: I realise that--

STANLEY: With respect that's not right. There's a storm warning that's been issued and which evidence has been given was received, faxed to the Young Endeavour and that storm warning does give the details, it does give the wind estimates. My recollection is that it was in fact read out on a sked.

CORONER: You're talking about the one at 213?

STANLEY: 214 yes.

HILL: I understand that but what I got from those witnesses over the last two or three days is there was a fax that went to the Young Endeavour but I haven't got from them which fax, and I've got two faxes and I'm trying to pin down from the Weather Bureau which fax went, whether I've got a public statement of a storm warning or whether I've got the document under the contract that went to the Young Endeavour or both. I've got no evidence so far.

CORONER: Yes but you're not right on that point with this question. I think that's Mr Stanley's argument, he is very simply saying the 1450 document was issued pursuant to the contract for the waters north of Merimbula if you like, Sydney to Jervis Bay where the fleet was.

HILL: Right, and if that's the only document that went to the Young Endeavour and not the other document, then that should be clarified and that's what I want. And I'm simply pointing out at this stage that this document, although it has a storm warning on it, doesn't deal with winds or anything that's happening to south of Merimbula, and that is not dealt with until the next document that goes under the contract, and that's what I'm after.

CORONER: That's true. I certainly do note Mr Stanley that, on your instructions, the contract called for this type of report for this area only. I note that.

STANLEY: Yes. Of course the reason for it is obvious, being that in the anticipation of the Yacht Club, this was the area that the yachts were going to be in at the relevant time.

HILL: I accept that entirely Mr Coroner, but what I am trying to establish is what went out to the fleet, and that's important. if there's been a breakdown of some description then that has to be looked at.

CORONER: I think Mr Badham understands.

Q. What comment do you make? You've heard the objection.
A. Yeah, no agree with that, with the comment.

Q. That ameliorates the position does it not, Mr Badham?
A. Yes. I still think that the outlook - I mean they're giving an outlook for south of Jervis Bay - sorry, winds moderating north of Jervis Bay and gale to storm force winds south of Jervis Bay, and if that's what they consider to be a good description for yachtsmen then that's it. I mean according to the letter of the law--

Q. That's another issue, just how good the description is, but you take the point that this report is really primarily dealing with the area where the fleet is?
A. Yes, yes. The next one isn't.

Q. Anyway, I'm sure you'll have your day. You'll have your say.

STANLEY: We may be able to assist because the sked that was given, and this appears from the tape, in fact included it and it would seem word for word, reading out the priority storm warning that in fact was issued at 2.14, so it was clear that the Young Endeavour did have a storm warning as well as the special race forecast.

CORONER: All right. Mr Santamaria, you might ..(not transcribable)..

SANTAMARIA: Yes, I do.

STANLEY: All I would like is someone in the witness box that will tell us that.

CORONER: That's right.

HILL: Q. I take you over to the next one which is issued at 0213 hours on Sunday the 27th. What's your first comment on that?
A. Well again I think generally that these forecasts are fairly cryptic and succinct. I mean this - this is not a public forecast. This - I mean I described yesterday, I said that I thought that the storm warnings could have been more elaborate with their breaking up of the low into quadrants and whatever. But I mean it's official practice that gale warnings and storm warnings are quite succinct and cryptic because of the old way it went out by morse et cetera, et cetera, and they are always fairly tight documents. This does not have to be a tight document. This is a forecast made under contract by the Bureau for 100 yachts and it's only supposed to be used by 100 yachts in the race, and therefore they should be as descriptive as need be to completely describe the prevailing situation and what's going to occur.

CORONER: Q. So you're saying you understand a normal

weather forecast being, as you put it, cryptic and succinct?
A. Yeah.

Q. That sounds odd but I can understand what you mean. And that's so that it conforms everywhere it's seen. But this is a completely private document.
A. Yes.

Q. And those constraints, they just don't have to be placed on it?
A. They don't have to be here at all.

Q. I imagine they have to use the same basic terminology though such as--
A. Of course.

Q. --storm warning, gale warning?
A. Yeah. So the synoptic situation says a low deepening near 41 149 and that's moving east nor'east at 20 knots. They don't say when the low was there, where it's expected to move to. The warnings - at all times has the storm warning and the gale warning, and the winds are 25 to 35 knots, winds increasing south of Merimbula reaching 40 to 50 knots as the low deepens. Now it's just not - it is not giving sufficient information to the yachtsmen. It's too cryptic in my opinion. I would say at all times the forecast in these specific race forecasts and in fact from Sunday onwards, all the storm warnings referenced winds of 40 to 50 knots. Now if you're talking about winds of 40 to 50 knots, why do you need a storm warning, because the storm warning only comes in at 48 knots, then why talk about winds of 40 to 50 knots? In fact on the Saturday most of the forecasts and warnings were talking 45 to 55 knots and yet by early Sunday morning they've cut that down five knots and they're talking now 40 to 50 knots. And in my opinion, the average yachty who hears 40 to 50 knots says I can handle that.

Q. What about the line above that where it says west south-west winds, 25 to 35 knots with stronger gusts? And then we get winds increasing to the south from Merimbula reaching 40 to 50 knots this afternoon as low deepens. There's no mention of gusts with this. Are we--
A. We're short on words.

HILL: Q. Now we've got there waves two to three metres, rising four to five metres offshore in the south, and then we get the swell offshore south of Merimbula.
A. That's misleading as well because in Bass Strait, in a situation like this you cannot differentiate between sea and swell, and in fact the forecasts which were issued by the Victorian regional office at all times did not differentiate between sea and swell, they just said waves, because there is no swell in the situation, in the Bass Strait one. Now certainly there would be swell between - there would have been some leftover swell between Gabo Island and - or particularly north of Gabo Island up towards Jervis Bay, but in the developing low pressure system where people got into

trouble there is no swell as such. It's - it's a set of wave trains. They are locally wind-generated waves. So to differentiate between sea and swell is actually incorrect in the area where I've marked A and all that sort of stuff, it's just not what you do. And the Victorian office who forecast for the oilrigs in Bass Strait forecast correctly in that situation where they forecast waves.

Q. I think the next document is issued at 1209 hours on Sunday 27 December. This is where we're starting to get into the storm, or the fleet was, rather. And we've got warnings, storm warning is current south from Merimbula, gale warning is current from Broken Bay.
A. This one's - I don't know if this one's correct here.

Q. Have you got that?
A. No. I think it's missed in the photocopy. I've got 02 on Sunday and then it jumps to 02 on Monday, so we've missed a page here. Here we go, it's over here, it's in the wrong place.

Q. Okay, you've got it?
A. Yes, 1209 on Sunday. This is actually the last forecast that a yachtsman could have before they're in it.

Q. This is area Jervis Bay to Gabo Island. First of all if we deal with the synoptic.
A. Well again I think this is just using too few words. A low of 987 in eastern Bass Strait. I mean damn hell, you can tell them where it is, it's not a secret. You can actually put a lat and a long on this, and you can actually put a lat and a long where it's going to be, not just a one line, a low of 987, which is a significant low, in eastern Bass Strait, expected to move east today. Now that is - that is very very poor on words.

Q. Warnings. Storm warning is current south from Merimbula, gale warning is current south from Broken Bay. Anything on that?
A. Yeah, that's--

Q. Happy enough with that?
A. Yeah, yeah.

Q. Wind. Wind south-west 25 to 35 knots with stronger gusts, increasing to 40 50 knots offshore south of Merimbula today.
A. Yeah, well the same comment applies. They're referencing 40 to 50 knots but they've got a storm warning out. The winds don't match the warning.

Q. Is that because storm--
A. They match by two knots.

Q. Because the storm starts at 48?
A. The storm starts at 48 and goes on.

Q. And this is more - it's more in--

A. This is what you would call Force 9 on the Beaufort scale, severe gale, which is 40 to 50 knots.

Q. And in fact this has got, if I can use the term, it appears to be at least seven knots more in the gale area than what it does in the storm area. The storm starts at 48 knots, 49 and 50.
A. Yeah.

Q. It says then wind decreasing to 15 to 25 knots north of Merimbula Monday and 25 to 35 knots south of Merimbula during Monday.
A. Yeah.

Q. Any comments on that?
A. No. I mean the seas - the same thing with regards to sea and swell, and that is that there's only waves in the Bass Strait area under these situations, there's no swell as such.

CORONER: Q. Well they've got waves there though.
A. Yeah waves, but they also have swell, so therefore they're talking about waves rising four to five metres and--

Q. You add waves to swell in a situation like that or--
A. Well you can, but that's not what occurs there. That would occur on the New South Wales coast but it doesn't occur in Bass Strait. So in Bass Strait, you know, it needs to be more specific because in Bass Strait the waves weren't rising four to five metres, they were rising at least five to seven, if not six to eight, without even taking into account what we just discussed previously.

HILL: Q. That's the eastern current?
A. The adverse current, yes.

Q. Well going back to the--
A. And at the same time then, there's a forecast issued at the same time for the same thing by the Tasmanian office.

Q. Yes? Where's that?
A. Well it's the same afternoon. The Tasmanian office - which one is it? It's issued half an hour later, it's the one with different type.

CORONER: Marked--

HILL: Q. Yes, at the back.
A. At the back. And so there's a separate forecast half an hour later from the Tasmanian office which is covering the true part of Bass Strait from - it's actually, you know, from 38 to 40 south and then from 40 down to Eddystone, Eddystone to Tasman, so--

Q. Perhaps if you could hold it up an--

CORONER: That talks of 40 to 50 knots near the Victorian coast.

HILL: Q. Is that the one at 1236 on the top?
A. 1236 yes, so this is the same - covering the same period and it's got to cover further south, and at least they've used a few more words. They're covering more area I suppose. The synoptic situation is a low of 988 centred just east of Flinders Island at noon, so a little bit more specific there. It wasn't east of Flinders Island actually, it was somewhere else, but that's by the way. Expected to move slowly east and then south-east today. So once again I think, you know, they could be a little bit more specific in saying exactly where this thing is and where it's actually going to. And as I say, there's no - there's no constraint on words here. This is a contractual forecast which the weather bureau said that they were contracting $35 a forecast, if I remember rightly yesterday. I couldn't do it for $35 a forecast.

Q. And then we've got the warnings. Now that's a warning for eastern Bass Strait.
A. Yes, well yes, well it's obviously for the Victorian area. They're forecasting storm force winds on the north-west quadrant of the low. They don't say that but that's what they infer.

Q. How are they doing that?
A. Well that's where the nastiest winds were, but they're saying that in the forecast for the next 24 hours, from 38 to 40 south, west to sou'west winds of 30 to 40 knots, locally 40 to 50 knots near the Victorian coast. Now again that - easing to 25 to 30 knots, 35 knots by early Monday. You know, there is room there to be a little bit more specific I think in actually painting the area in of where these winds are. I mean just near the Victorian coast, what does that imply? Coastal waters? Sixty miles out? I don't know. It's a little vague. It would indicate that when you get out away from the Victorian coast, whatever that definition means, that the winds are not going to be 40 to 50 knots but they're only going to be 30 to 40 knots.

Q. What about this, we've got five to six metre seas?
A. That's better, yes. I mean that's what they are, they're seas, it's a seaway. Five to six metres, they might be on average five to six metres through the whole of eastern Bass Strait, but as I say, in the storm force area the seas would have been larger than that and six to eight metres I think is the - if you do according to the normal algorithms.

Q. How am I to read that five to six metre seas slowly - is that--
A. Abating.

Q. Abating is it?
A. Yes.

Q. South-west swell three metres. What is that?
A. Well again in that situation, particularly where the winds were storm force or - you don't differentiate between

sea and swell.

Q. Are those seas consistent with storm force winds?
A. No.

Q. What's wrong with them?
A. Well they're not high enough.

Q. For the storm force wind?
A. No. Five to seven would be the minimum and six to eight in this particular situation in my opinion would be the - what you would forecast.

Q. What's the next point on this?
A. I don't know. No, that's really - I just noticed that when I flicked over, that that was the same time as the other one, that's all, so they were doubling up in terms of that the Sydney office was looking after to 38 south and then the Tasmanian office was looking from 38 to further down the coast.

Q. What are we to make of the fact that the seas are not consistent with storm force winds? I mean is that possible? Is it normal or is simply inaccurate? What--
A. I don't know. I mean maybe in the forecaster's eyes here they're only looking at the 40 to 50 knots just in one little area near the Victorian coast and therefore they've produced a seaway which they think is reflecting the 30 to 40 knots, which is pretty much what they're saying is the prevailing breeze through - I shouldn't say breeze, the prevailing wind in Bass Strait at that time.

Q. Is there anywhere in here that takes into account in your opinion the eastern coast current?
A. No, no.

Q. It just doesn't take that into account?
A. No, not at all.

Q. Well if I wanted to know where the eastern current and wind is coming down and this low is generating waves out of Bass Strait, and they go to meet and clash much as you might push water in a bowl together and it clashes, how do I find that out?
A. Well you'd go to the briefing where they did actually show you a - and they gave you a colour map in - of the current and you'd work it out yourself.

Q. I'd work it out myself? I see, all right. If I could take you back then to - is there anything else you want to point out on that document?
A. No, that's fine.

Q. What about the actual, if I can use the word, the public storm warnings, and that's--
A. Well the only thing that surprised me - I mean I remember at the time thinking - when I saw - I got up very early that morning and actually drew my own charts and

played with the waves and I thought, you know, this is not nice, mainly because the forecast that I'd given was not as nice as what I thought it - as what it could have been because I'd discussed it long enough with different people. I was surprised, as I said to you before, that the warning - there's a storm warning issued and it's issued at the correct time and it's covering the correct area at all times. But on the Saturday the storm warning is referencing 45 to 55 knots, but on Sunday they drop it back to 40 to 50 knots. So in other words - I always tell my sailors, and I think Ken Batt would always tell his sailors at the class, that the most important thing that you do when you listen to weather is you write it down, and you write down everything that you hear on the radio because you don't rely on your memory. And when you write it down you get a picture of the continuity of the forecast so that you see how things are progressing, and in this situation the forecast on - the warnings on Saturday and the forecasts on Saturday were saying 45 to 55, and the warnings on Sunday and the forecasts on Sunday were saying 40 to 50, so they'd eased it back five knots. So they're indicating that by Sunday morning that the situation isn't actually going to be as severe as what they said.

Q. I'll take you to that. Perhaps if we start with the priority storm warning of 1414 on Saturday 26 December. Do you have that there? It's in appendix 4.
A. Yeah yeah, 1414 priority storm warning. Yes, got it.

Q. I think that the only portion that really deals with the storm warning is the priority storm warning coastal waters south of Merimbula. The rest is a gale warning and strong wind warnings but for different areas.
A. Yes, that's correct.

Q. First of all the synoptic. What on there brings the storm warning to my attention, anything, in the synoptic situation?
A. Well no. I think - I mean I stress what I said yesterday and that is that in my opinion still that these whole warning things are a little bit tight on words, but that is the nature of storm warnings, and if they wanted to be tight on words there then they could have been more elaborate in the forecast. But in this situation they're discussing a low of 995 near Lord Howe Island as moving - as slow moving. Cold front moving over east Bass Strait. So again, even though the forecasters know it, there's no reference here of what's actually going to cause the storm force winds. The forecasters at 1414 on Saturday afternoon clearly knew that there was going to be a low in Bass Strait and it was going to intensify quite rapidly on Sunday afternoon, but it doesn't say that.

Q. Then we get the warning and the first line seems to deal with Broken Bay and Ulladulla, and it appears - and you correct me if I'm wrong - it's not until the fifth line down that actually deals with the storm warning. Is that right?
A. Well that's right. I mean this is a conglomeration of

warnings. There's a storm warning, a gale warning and a strong wind warning, so they're taking it sequentially. Probably in the wrong order but anyway, it's done sequentially and yes, the gale - the storm warning is referenced in those westerly winds increasing 45 to 55 knots offshore south of Merimbula late Sunday afternoon.

Q. That's it?
A. That's it.

Q. It's 45 to 55 on the Saturday?
A. Yes.

Q. What about the seas? Which one do I look at for the storm warning?
A. I don't know.

Q. I'm sorry?
A. It doesn't - I don't know, sorry. It doesn't say.

Q. So somewhere there will be two to three metres swells and somewhere there will be one to two?
A. Yeah.

CORONER: And that could be anywhere in the three areas covered by the strong wind warning, the gale warning and the priority storm warning presumably.

HILL: Q. Is that right?
A. Well there's no differentiation there, so it obviously grades from one to the other or whatever. I mean it's not clear, so take the worst.

Q. And what I'm supposed to do, as I understand, I'm supposed to add the seas, one to two metres, rising to three to four metres with the change, and the swells. Do I add these together and get what I'm likely to--
A. For your maximum wave - your maximum significant or average wave height, yes, you would add them together, but I stress again that would be on the New South Wales coast where you do have sea and swell, but in the Bass Strait, in this storm force situation, you don't get sea and swell, they're just waves. It's waves, it's sea.

CORONER: Q. But when you look at the other reports we just had a look at, you'd be a rash person to say well because it mentions a swell it mustn't refer to Bass Strait?
A. Yeah. No, no, I mean in lesser situations in Bass Strait you can have sea and swell, but in the situation that developed on this particular occasion it's all seaway. The swell just becomes insignificant, totally. But this is referring down the New South Wales coast so therefore it's sea and swell and it's - but unfortunately it doesn't differentiate well between where it applies for.

HILL: Q. This I take it is for the coastal seas is it, because over the next page it seems to be dealing with the high seas.

A. Right, yeah.

Q. But how do I know this is the coastal water one?
A. Because they would have - I mean it says coastal waters.

Q. Okay, so that's what I take, it's all that - that makes it coastal waters.
A. Yeah.

Q. Over the page is the high seas weather warning for met area 10 issued by the Australian Bureau of Meteorology, Sydney, 01315. Now UTC?
A. Yeah, GMT Zulu, that's roughly the same time 03.

Q. It's really the same time as 1414, it's just that this is so that - because on the high seas there'll be--
A. It's master mariners' talk.

Q. They will be using on the--
A. Talk GMT.

Q. Greenwich, okay.
A. Yes, lesser mariners.

Q. So we've got a storm warning for south-eastern area. Now what about the situation, what does that tell us?
A. It's the same thing again. It describes or state the cold front but it doesn't mention the low. There's no mention of a low anywhere there.

Q. What about the area affected? That seems to give latitude and longitude.
A. Yeah, the area. Yeah, that's fine. They're painting out the area of where these winds are likely to be, so they're saying that inside that box the winds are gusty west sou'westerlies 30 to 40 in the far south, rising to 45 to 55 knots. But it's - a few more words could maybe clarify a lot.

Q. Such as what?
A. Well such as telling first in the situation what's actually occurring, that there is a low going to develop, it's going to be 988 hectopascals at such-and-such a time tomorrow evening and it's expected to move east at - expected to track whatever you want - you can track its position if you want to be quite descriptive or you can just say it's going to be moving east at 20 knots or whatever, and then, you know, as the situation becomes clearer you can obviously differentiate the winds a little bit more clearly if you wanted to. In other words, they've just painted an area, a box, where they're saying the winds are 30 to 40 tending north-west to west, 45 to 55 knots south of 37 south. You can be more descriptive there. The low is not symmetric in its winds and the situation is certainly not symmetric, and there were going to be stronger winds in some - in the north-west quadrant and lesser winds in the south-east and eastern quadrant.

Q. The next one was where it - the winds seem to be adjusted somewhat. Which - the following day was it?
A. Yeah. Generally on Sunday all the forecasts out of the New South Wales office were 40 to 50 knots. The forecasts out of the Victorian office which were either for the Bass Strait forecast that they do for their just general shipping forecast, or their warnings still mostly referenced 45 to 55.

CORONER: Q. No, that's not right. If you look at the New South Wales warning for 2059 Saturday--
A. Yeah, on Saturday they were--

Q. I see, 45 to 55.

HILL: Q. Saturday they were going 45 to 55 is it?
A. Yeah, but on Sunday they were 40 to 50.

Q. Well the first one that I've got is issued at 0253 hours on Sunday the 27th. Is that - storm warm warning coastal waters south of Merimbula.
A. Yeah.

Q. That appears there to have dropped down from 45 to 55 to 40 to 50. What am I to make of that?
A. They obviously thought it wasn't going to be quite as severe as what they indicated the previous afternoon, I would presume.

Q. Well once again it's storm warning, gale warning and strong wind warning. Once again the synoptic chart doesn't really tell us anything more than what we have--
A. Well they've mentioned a low now of 992 near north-east Tasmania. Unfortunately it still misses the kernel of the problem which is actually that that low was actually going to intensify and actually move backwards on itself, and during those early hours of the morning the low was going to intensify in eastern Bass Strait. So it's a fairly - I mean it's nice that they mention the low near north-east Tasmania deepening, but they don't say where the low's moving to. They don't say anything actually.

Q. Then we have the warning. We have west south-west winds 25 to 35 knots south of Merimbula, increasing to 40 to 50 knots offshore late this afternoon. What am I supposed to know about offshore?
A. Well I mean, remember that this is primarily for the New South Wales coast which then just tucks down into the north-east parts of Bass Strait, so it's primarily dealing with the coastal areas and hence there's, you know, coastal waters and offshore waters, being some vague line I presume around 60 miles off or whatever where there's coastal waters and waters to sea I assume.

Q. Then we've got Broken Bay, Seal Rocks and Broken Bay. Now seas. I've got seas two to three metres in the north, rising to three to five metres in the south offshore. How do I interpret that?

A. Well that's - what they're indicating there is that the - in the south, for instance, that the seas will be rising three to five metres away from the coast, given that they're picturing a westerly type wind, a westerly flavoured wind, then there's - in a certain fetch offshore that the winds - the seas, the seaway is going to be increasing as you go further offshore. That's what they're painting. However, it doesn't allow for the leakage that comes round through Bass Strait, so in actual fact the waves coming - that are generated during the course of this Sunday which come through Bass Strait and come across to the corner are not increasing offshore, they're full on.

Q. What about this, swells rising in the south offshore to two to three metres? Do I just add those on top of the seas?
A. Once again, on the New South Wales coast if you - yes, you would. In Bass Strait it's not applicable in this situation.

Q. You were asked this question at 26, that the majority of boats - this is question 57 - competed in - sorry?
A. Which page again?

Q. I'm sorry, page 26 of your statement.
A. Right, yes.

Q. You were asked this question, part of which was "so that the majority of the yachts that are competing in the race are relying on a weather briefing that's been given two days previously, is that correct?" "Yes, that's right." What exactly - what are you talking about there? Is this the briefing by Ken Batt?
A. Yes, it's the - it has been the standard practice. I mean unfortunately for the Sydney Hobart it starts on Boxing Day and Christmas Day is the day before, and on many yacht races it's customary to have the briefing the day before. But everyone's doing other things on Christmas Day so it's held the day before that, which is Christmas Eve. So it's held - the briefing is held 48 hours prior to the race, and obviously on - I mean going back to when I did it, even 10 years ago where the models weren't that good, there was sometimes quite dubious forecasting to even know what was going to happen two days ahead, let alone five days ahead so - but the accuracy and the better performance of the models over the last few years has certainly assisted in - the briefing officer to at least enable to give, you know, a reasonable outlook for the race on Christmas Eve for the Boxing Day start. But, you know, obviously in this situation it was a - where the models were offering various solutions to a developing low pressure system, then you know, the situation was uncertain and so the forecast - the briefing that was given, you know, was therefore uncertain, and I note with pleasure that the CYC changed that proceeding this year in the last race.

Q. To what?
A. They now have - they instigated a second briefing on the

morning of the start.

Q. I was going to ask you about that.
A. Yeah.

Q. That would take into account the US model I think and--
A. Well it would take into account whatever there is. I mean it's just two days closer to the event. It's the morning of the start rather than--

Q. What time, any idea?
A. What, the briefing?

Q. Yes.
A. I think they did it at 9 o'clock. It was either half past eight or nine.

Q. Is that compulsory, do you know, or--
A. Yes, it was this year. It was compulsory for skipper and navigator I think.

Q. So they now do it at about nine-ish on Boxing Day?
A. Yeah.

Q. I forgot to ask you, that the areas on the chart that you marked A, B and C, some are obviously coastal, but are others what you would class as high sea?

A. Yes they are. In fact, I mean eastern Bass Strait it technically high seas, it's away from the coast, so yes it is. That's correct. Although it's, I mean the Victorian Regional Office do a standard forecast for eastern Bass Strait which covers out to that area but it is away from the coast so it is covered by a routine forecast but it's still technically high seas area in terms of being offshore.

SHORT ADJOURNMENT

HILL: Mr Coroner, the situation is that I have a few more questions of Mr Badham and it is proposed that at that stage he then be stood down, having finished his examination in chief, and Doctor Leslie be called.

CORONER: Yes, because Doctor Leslie can't be here next week, and I do want to finish the phrase of the inquest as quickly as I can now.

HILL: Then my understanding is that, as far as Mr Badham is concerned, Mr Stanley may not be able to finish his cross examination of Mr Badham today because of certain things that have been raised.

CORONER: I understand that.

HILL: But I could put Mr Winning in.

CORONER: We will see how we go with time, Mr Stanley and Mr Santamaria have got to get back to Melbourne and with the traffic to the airport being what it is, we've got to leave them time to do that. That's the least we can do for our Victorian friends.

HILL: Q. Mr Badham, there are four matters that I want to direct your mind to, the first one is this, it's at page 50 of your statement. That you made the comment - and this is important - that the weather forecast, and it's in answer to question 85 that even if they'd read what was actually happening at Kingfish B, the winds were 55 gusting to 65 knots, 7 metre seas etcetera and you say this 'but I still have the opinion that 99 percent of them' and you were talking about the yachtsmen 'would still say well that's the forecast and I can cope with that, I'll keep going anyway'. Is that still your opinion?
A. Well, in terms of the forecast, yes. I think it's a pity that the - as I said previously - that the specific race forecast which do not have to be tight on words could have been more elaborate of the situation. In fact particularly on Sunday afternoon the forecast at 2pm on Sunday when obviously some of the boats were just about to get into trouble and there were some that were still several hours away from being in trouble, that the low had already formed by then and was getting very close to crossing the axis of the rum line, the fleet as they come down. In other words the rum line goes from north to south and the fleet were travelling, and the low was travelling from west to east so that they were crossing. At that time that forecast

that was issued early on Sunday afternoon could have had some, an emphasis on the actual observations that were available at that time. I mean particularly the Wilsons Promontory observation of a mean wind speed of 79 knots gusting 92, and the observation from Kingfish B platform of 55 knot average winds with 7 metre average seas, maximum seas 11 metres or whatever. If you put in the actual observations and stress those and say this is what has actually been observed immediately to the west in Bass Strait, then I think then that the yachtsmen might take more - well notice, but put more credence in what was actually being read. But at the time what was being read as we've gone through before was a wind speed of 40 to 50 knots and seas rising to 4 to 5 or whatever metres, and the average yachtsman would still think I can cope with that.

Q. The forecast that he was getting, the yachtsman was getting, you think he would have said 'I can cope with that' but had he been told what the real situation was--
A. Yeah, I mean, especially, I mean Kingfish B platform doesn't, it's a little bit high but it doesn't tend to over read. I mean Wilsons Promontory does grossly over read and you've got to discount at least 25 percent, maybe 30 percent. But put the raw observation in. If a yachtsman sees that the wind is actually 79 knots average, don't tell him it grossly over reads if he doesn't know it and that it is gusting to 92. I think that would actually make them stop. I mean, there is room there in the forecast to have a little bit information, this is a tailor made product, they've paid for this product, give then quality.

CORONER: Q. And charge more if necessary?
A. And charge more if necessary. I mean $35 for a forecast is not a lot of money, in fact if you work it out, I don't know what the Bureau charge for a forecaster but it used to be $100 an hour, so that's equivalent to 20 minutes work, but for the forecast. I don't think that's what the CYC had in mind when they were contracting the Bureau to forecast.

OBJECTION (STANLEY). NOT WITHIN KNOWLEDGE OF WITNESS.

HILL: Q. Over at page 51 what you've actually said is 'so I think that it's very much just an off the shelf straight forecast', that was given to the yachtsmen?
A. Yes. I think if you look at the format and the amount of words and the actually phraseology, everything else, is exactly the same as you would get in the coastal waters forecast that was issued for the same areas at the same time. It's not tailor made to the client.

Q. In fact you go a step further and you say there in the answer to question 91 'I don't think it's good enough for a hundred yachts'. Is that still your opinion?
A. Yes I do. And particularly in this situation where you have an extreme weather situation you can afford to be more elaborate.

Q. At page 53 you in fact have some praise for the

Victorian Regional Office, at point 4 on that page you say that at all times their forecast was better than the forecast from the Sydney office or the Hobart office that were forecasting for the fleet as they sailed through that region. You're still of that opinion?
A. Yes. Their forecast was generally of a stronger winds and of larger seas and not differentiating between sea and swell. And I think their forecast, they have more expertise in that office for eastern Bass Strait because they forecast for the oil rigs. I think if you look at the forecasts that they did and you compare it with the observations at Kingfish B, you'll find them almost perfect. Now that's not forecasting perfectly for where the yachts were, the yachts were a little bit further to the east than the oil platforms and the conditions were correspondingly more severe. So in actual fact, in my opinion, when you compare the observations to the forecast, even the VRO forecast was not necessarily perfect or spot on where the yachts were. But it was perfect for the oil platforms and that's where their expertise is, and they were closer to the mark.

Q. If you just look at this document here, I think that that document is the list of vessels, yachts, that you gave your weather forecast for in the 1998 Sydney to Hobart race, is that correct?
A. That's correct, yes.

EXHIBIT #12 LIST OF VESSELS TENDERED, ADMITTED WITHOUT OBJECTION

<WITNESS STOOD DOWN

<LANCE MAXWELL LESLIE(12.05PM)
INTERPOSED, SWORN AND EXAMINED

HILL: Q. Professor Leslie, would you give the Inquest your full name please?
A. Lance Maxwell Leslie.

Q. You're professional address sir?
A. The University of New South Wales, School of Mathematics.

Q. You're qualifications?
A. PhD in Mathematics, specific subject was meteorology.

Q. I've been given a curriculum vitae?
A. Yes.

CORONER: No argument about the expertise of the witness gentlemen? Thank you. Accepted as an expert.

HILL: Q. I think you've had 32 years work with the Bureau, that is the Weather Bureau?
A. Correct.

Q. You have a computer model of weather predictions, is that right?

A. That's correct.

Q. Where does that run at?
A. It runs formally at the University of New South Wales, that's the main place. There are one or two other locations, like the Australian Technology Park but basically at the University.

EXHIBIT #13 CURRICULUM VITAE OF WITNESS TENDERED, ADMITTED WITHOUT OBJECTION

Q. You in fact, on 26 December 1998, your model was working?
A. Yes that's correct.

Q. You notice something about it, what did you notice?
A. Well, do you want some context?

Q. Yes, go on please?
A. I can run the model remotely and for the five or six years I've done, so from the Bureau of Meteorology, the morning of the race day and made the weather forecasts from that available to the Bureau of Meteorology staff to use as they wish. So I've actually been located at the Bureau while the model has been run and on 26 December 1998 I was in the Bureau from about 6am to 2pm.

Q. What happened?
A. I run the model and it was running in a slightly different configurations - this gets a little bit complicated - but it was an improved version being used for the first time in the Sydney to Hobart race so we expected to get more accurate forecasts out of it. The penalty you pay for that is it takes longer to run, and on this occasion the Bureau staff were actually setting up their stand, if you like, at the CYC a bit earlier so I didn't have time to run it and finish it and give them the forecasts in the usual form. So what I did instead was, as the model was running produced output at certain locations down the coast, the most notable being Eden. I had the wind levels coming out every five minutes, and I watched those increase during the, particularly during the early hours of 27th up to and nudging towards, certainly into gale force and getting very close to strong force.

Q. What time is this that you see this?
A. When did I see this? Around about 7 - 7.30, and I drew--

Q. On 26th?
A. On 26th, that morning that I was in there. And I drew this to the attention of Bureau Officers, Ken Batt, Brett Gage and Peter Dunda.

Q. Just so that I understand this perfectly correctly, it was certainly into gale force on your model and it was starting to, did you nudge into?
A. It was in the high, the very high part of gale force at

Eden, that was a point source.

Q. When you say very high, we've been told that 48 is storm, 34 to 47 is gale force?
A. It was up around the 46 - 47 at Eden.

Q. So it was that close?
A. It was as close as that, yes.

Q. What did you do about that?
A. Well, once it crossed into gale and was heading up further, that's when I brought it to the attention of the three Bureau officers that I just mentioned. And, as I understand it and they can always correct this information, it was used in part to upgrade the 9am forecast that they issued to gale force.

Q. What did the computer model continue to do after that? If anything?
A. The thing that really concerned me, and this is the reason why I kept mentioning it to the Bureau officers and why I stayed on as long as I did, was that the period of gale force and near storm force conditions that the model was producing continued for over 24 hours. It was pretty alarming.

Q. What 24 hour period was it predicting?
A. From the early hours of 27th through overnight into the early hours of the 28th.

Q. It was still up around the--
A. It was back into the 30's by then but had been a very slow decline from mid 40's. Again I emphasise this was at Eden, only one point.

Q. What time did you remain there until?
A. I remained there until just after the 2pm forecasts were issued because I was curious to see what the other models that come in for the afternoon forecasts were going to do, given that mine was a little bit stronger in terms of wind strength than the other models I'd seen. And, with those later forecasts, and they went into the 2pm Bureau forecast as I understand it, were then, all of them showing storm force. Then I saw them issue a storm force warning and then I went home.

Q. You have seen the reports, various reports that have come from people in this storm and you see there that - page 9 of your statement - you say that you've seen sustained winds, wind gusts above 80 knots and sustained winds above 55. You've also seen I think video footage of this storm and the vessels that were in that storm. Does what you saw on the videos, the pictures of this, does that reflect gusts of 80 knots and winds above 55?
A. Yes it does.

Q. I think you would also tell us something about the seas there. You've seen the - I realise it's very very difficult

- can you tell us about the Weather Bureau when it says that you should add 40 percent to the average wind speed. First of all, do you know about that?
A. Yes I do.

Q. Do you agree with adding 40 percent?
A. Yes I do.

Q. You don't regard that as too high?
A. No, sometimes it is high, sometimes it's a bit lower, that's a rule of thumb.

Q. What above wave heights?
A. Wave heights is a bit tricker, it's still a major research problem and it's in fact one that's going on at the University right now, we're linked up with a wave expert there and we're trying to couple together the atmosphere and the ocean to get more accurate predictions of the sea state in these very high wind conditions because the - and I've got to say here that I'm not a wave expert, that's part of the reason I want to move into that area, but the really scary part is the steepness of the waves as well as the height of course, which are related and if they're breaking, if you've got steep seas breaking out in the open ocean that's a desperate situation.

Q. We're also informed from the documentation that you should add, I think, you should 86 percent to the wave height. What's this about?
A. It's a particular very precise number, I don't think that would stand up to too much scrutiny but again the rule of thumb that I'm aware of is that you can possibly double the wave height for these freak, rogue, whatever you like to call them, waves that occur.

Q. If we have 12 metre waves you can double that, is that basically what you're saying, therefore we'd end up with a 24 metre one. Is that how that works, is it as simple as that?
A. It's saying is, that's a possibility, doesn't mean it will occur. It wouldn't surprise me, it's getting pretty big, it's up over 70 feet, that's a, as I said I am not an expert, I wouldn't like to say there was 70 feet waves out there.

Q. Well that's fine. I think that you also had some comments to be made about how you would instruct people about these waves, the wind and things like that, especially in regards to the briefing that takes place. You had opinions about that, what were they?
A. Well they are only opinions which--

Q. No, no, no--
A. I've got to point out that it's my personal opinions, based on really what happened after the event, speaking with people I knew associated with the race and other connections, what I'd heard, what I gleaned in other words as an extremely interested person in the event. The scales

or the terminology used in the forecasts is clearly, and it's come out in this inquiry, were not well understood, particularly the categories of gale and storm and so on. And it's recorded in the interview with the police that a lot of people tend to think of gale as being worse than storm.

Q. So how do we cure that? Do we educate them or do we something different with the terminologies or what is it, what do you think?
A. The first point is obviously something has to be done because how you do it I don't know that it is up to me to prescribe, but I would like to suggest that something has to be done.

CORONER: Q. What about at the briefings? You seem to be talking about videos of examples of say storm force winds in Bass Strait, is that on the right track, that type of thing? Gale force winds--
A. Yeah this is the kind of sea you might expect--

Q. You might expect to get gale force, storm force or rather a rating of knots?
A. Yeah, exactly.

Q. And if you see strong winds--
A. Correct, yeah. If you see that kind of thing you would be pretty frightened. That would be a good idea.

HILL: Q. What you're suggesting is that when you have the briefing, you say now this video here, this shows you what a gale looks like and this is what it will do to your yacht, and this is what a storm looks like and what is likely to happen to you. Is that what you're proposing?
A. Yes, it's sort of, the Beaufort scale you read it but it doesn't have the impact. I mean it says those things that we just mentioned but we now - that was written a long time ago, we now have videos to show you what it actually looks like. If you're a sailor and you see that it would have a lot more impact that just seeing exceptionally high waves, ships might be lost, you know, at time to view behind the waves. It sort of doesn't have the impact of seeing the video footage and helicopter rescues and so on.

Q. When you talk about education or something's got to be done about this, you're talking about videos, you're not talking about altering the system with regards the names for these particular events? Why I say that is because some people obviously thought a gale was worse than a storm, you're not talking that, you're talking about what, just educating them?
A. Well maybe I don't understand the terms of the Inquiry too well, in terms of what I can say.

CORONER: They're flexible.

WITNESS: Okay. Well it's just my opinion, I think a major effort should be made to improving these definitions so that

they're instantly understood. And as I understand it, in his year's race the Bureau did actually add a bit more to the forecast in terms of not only just giving them mean winds but adding gusts and also adding something extra to the wave forecasts, talking about maximum wave heights as well as just significant. So that's a first step anyway in the direction I'm thinking.

HILL: Q. You approve of that?
A. I think that's a good first step. I'm aware that there are constrained by international conventions and so on to some extent, to what extent I don't know. But clearly they did do something as a positive step but I'd like to see more I would think.

Q. Anything in particular more?
A. Well again the categories, if they're still using categories like storm - I've discussed this with a lot of people just out of interest, and again they think it is something you can sit in front of the fire and enjoy the pyrotechnics for an hour and then it is gone.

CORONER: If one assumes that the constraints on altering the terminology for the official forecasts are so great that that couldn't be considered, you can't see any problem in a real embellishment of those forecasts for the purposes of the regatta forecast can you?
A. No, not at all. I think that would be a good idea, to add something for these specialist forecasts.

Q. As you suggest they've started to do it this year?
A. Correct.

Q. In last year's race?
A. Correct.

HILL: Q. You see if you have to be official as it were, to the public generally and you're constrained by other countries, but if it was just between say you telling us what the weather would be, just us people here and you're not constrained by anything, you could be as elaborate and descriptive as you wanted to be?
A. Correct.

Q. You've got no problems with that?
A. No, not at all.

CORONER: Mr Stanley, maybe if you gentlemen have no objections can go next.

WEBER: I don't wish to cross examine.

CORONER: You don't wish to cross examine, it's all yours Mr Stanley.

STANLEY: Q. Professor, I just want to ask you what your relationship with the Bureau is. You were previously employed there?

A. Yes.

Q. As what?
A. As a research scientist in Melbourne at the Bureau's research centre.

Q. Does that mean that you were never in fact a forecaster?
A. I've never been an operational forecaster.

Q. But of course you're familiar with the role of the forecaster and what they have to take into account in giving a forecast?
A. I'd say of the 32 years plus the 6 or 7 I've been here, whatever, there wouldn't be many days I haven't been down to the actual weather office and seen the charts.

Q. Since you've left the Bureau 6 or 7 years ago, what's been you're relationship with it?
A. We have a memorandum of understanding which sort of links the University and the Bureau together such that people at the Bureau can do high degrees under my supervision but while they're at work. So in a sort of sense the Bureau becomes part of the University campus.

Q. But you're no way employed by the Bureau or--
A. No, not at all.

Q. No other association with it?
A. No. It's purely out of mutual interests.

Q. What is your particular area of expertise in so far as it is relevance to the issues in this Inquest?
A. It's wind modelling, modelling the atmosphere and therefore in this particular application forecasting wind strength.

Q. We're heard a lot about models but I'd like you explain how it is that a forecaster determines what wind speeds he will include in a forecast that's to be issued referable say to two or three days in advance?
A. Okay. They have a number of things they can use. First of all they have the charts in front of them and their experience and--

Q. When you say the charts, what do you mean, charts--
A. Sorry, the weather charts with what's present now on them, they have their experience of what happens under those kinds of conditions into the future. Then they have all the objective guidance from Melbourne and other centres around the word in the form of the computer weather predictions out to as far ahead as 10 days in some cases but 7 in the case of the Bureau's models. They have a briefing at certain times of the day where they get together an have input from people in various parts of the weather, the active weather area, weather forecasting area and then it is the responsibility, as I understand it, of the duty forecaster to frame a forecast based on all the available evidence and opinions from other people.

Q. So it is easy, for example, for people like Doctor Badham to be wise after the event but how easy is it to accurately forecast winds, extreme winds such as we experienced in the Sydney to Hobart race?
A. It depends, okay we're getting again into a complicated area. The short answer is, it is very very difficult. The further ahead you go it's very difficult, particularly if you're running ahead of model guidance which in this case was true in the early hours of the morning. The models came together in a very positive way and gave close to the correct guidance for the 2pm forecast. The earlier forecast, there was a range of predictions from the strong category up to, and mine was probably the most extreme, getting close to storm force. So it was a very quick decision that morning.

Q. So you had different models giving different indications of wind speeds and quite divergent?
A. Yes. And also you're looking at an example here and I've since studied it with a Bureau officer who has recently resigned, we've done a case study on this--

Q. I'll bring you back to that. I'm reminded, did you say that it was in your view a very difficult decision on that morning?
A. Yes. Because of the range of forecasts that were coming in.

Q. When a forecaster is to give a wind speed in his forecast does he have to also take into account the temporal and spatial factors?
A. Certainly.

Q. Can you perhaps expend on that, tell us what those factors mean?
A. If it's an east coast low which this turned out to be, and a fairly unseasonable one, you wouldn't say rare but you'd say it was uncommon, or a very uncommon event. You have an actual centre and predicting where that centre goes is very complicated because it is a function of all sort of things, land effect, other systems, grade indices, surface temperatures which you mightn't even have an accurate representation of. So where that system goes determines where the wind is going because in a particular quadrant of that swirling motion you get the strongest winds, and that's the most dangerous part. So you need to say with some accuracy where the centre of the storm is going.

Q. That's the spatial aspect, what about the temporal?
A. The temporal aspect is difficult too because it takes time for this system to convert from two converging different kinds of air masses interact and form the swirling system.

Q. When the forecaster gives a forecast he's giving it for a significant area, generally a specified area, whether it is east of Wilsons Promontory or south of Merimbula or whatever--

A. Yeah, they break the forecast up into areas and times.

Q. Does that in that turn make it, is that an additional factor that perhaps makes it difficult for the forecaster--
A. Well that's directly related to the problem you were alluding to.

Q. In fact, as you've indicated, the warning was upgrading from strong winds to gale force. What do you say as to the significance of that event in terms of the weather?
A. I can say with a lot of confidence since I was there, I was one of four people, I mentioned the other three already, there was a lot of activity on that occasion because people becoming aware of the fact that something was likely to happen or beginning to happen. And where I actually operate is away from the place of the actual forecast centre where they frame the forecast--

Q. In the same building but--
A. Yeah, I'm just in a different part of the building. The computer model is running away, ticking away in provision of forecasts and the two people, Ken Batt and Brett Gage were, they come in to have a look at the forecasts, and I called them in when I started to see the wind rising. So it was starting to get pretty active in there, particularly as we were in, we got to gale force, then above, etcetera. At that point, and again this is working on recollection, Peter Dunn, the forecaster in charge at some point for reasons he will probably explain upgraded the forecast, in my opinion very correctly to a high category.

Q. That's to the gale warning?
A. Yes.

Q. Did you regard that in fact as significant event, a significant change?
A. Most definitely.

Q. Is it something that's just done lightly or is it something that--
A. I can't answer that, I can only give an opinion, I've got to keep repeating that. In my observations and opinion that is not lightly, no.

Q. You've told us before that you've been involved in running models for the Sydney to Hobart race over the past, what, five or six years is it?
A. Yes, ever since I've come up here.

Q. Were you doing it in 1993?
A. No. That was the year before I came here.

Q. Are you aware that in 1993 there was in fact a gale warning issued and that--
A. I knew there was, it was serious event because I've heard the anecdotes but I know nothing about the situation.

Q. Over the time that you've been up here as you say and

involved over the last five or six years, have you been in the employ of the Yacht Club or the Bureau?
A. No.

Q. For what reason did you involve yourself in working on your model and then going down to the Yacht Club and assisting with the briefing?
A. Interest as a once - not for a long time now - active sailor, part time, mainly in harbours but also with - it's one of the events where you get a lot of coverage in terms of data, you can test your models out. In fact some of the boats are instrumented, and at the end of the race you can collect that data and help work towards solving the problem with maritime forecasting, because out there you're not getting much in terms of information.

Q. Not getting the feedback?
A. Yeah, that's right. So it's a very good situation for getting data that you would not normally get.

Q. In the ordinary course then, did you expect to be down at the Yacht Club on race day morning, assisting in the briefing together with Brett Gage and Ken Batt?
A. No, not assisting. All I do is produce my high resolution forecast charts. They get put on - they get hung up on the wall and if anybody's interested they can have a copy. But I certainly don't take it upon myself to give any advice whatsoever.

Q. Would you be there?
A. I'm there, yeah.

Q. Handing out your--
A. No, I don't hand out anything. It's stuck on the wall and the Bureau has a pile of them. If anybody wants them they take them. If the Bureau has a problem in terms of interpretation, you come over to me and ask. I deliberately - because I'm not trained as a operational forecaster, I would not advise anybody in that kind of capacity.

Q. In terms of giving or making forecasts for a race such as this, is the lack of data or information coming in a factor?
A. Yes, most certainly. Forecasting over the ocean and there's not a lot of data at the surface of those ocean areas.

Q. You were in fact back at the Bureau office when the decision to issue the storm warning was made, is that so?
A. Yes.

Q. At that time, what was the information that was available to enable that warning to be given?
A. The forecasts from the models from around the world and the local - well call it local, the Melbourne model, had come in and they were - they were showing storm force winds. Some of them I think were reading well into the fifties as mean winds. At that point it was unequivocal in terms of--

Q. And when you say into the fifties as mean winds, what does that mean in terms of winds, the maximum winds that might be expected with gusts?
A. Applying the usual rule, at least into the seventies and maybe - maybe 80.

Q. If one were to apply world's best practice to the forecast that was then made of an event that was then some 20, 22 hours into the future, what's your comment about the--
A. About the forecast that issued at - you're talking about the 2pm one?

Q. Yes, the storm warning.
A. I'd say that it was about as - it was no less than I

expected.

Q. Well that doesn't tell us very much.
A. Okay, I know.

Q. In terms of what perhaps is usual, what's the usual lag time between forecast and the onset of a storm?
A. Okay. So you're talking about the lead time for this?

Q. Yes.
A. Okay, I'm sorry, I misunderstood you. I think the forecast lead time and the intensity put out was excellent, yes, in world class terms.

Q. You say excellent in world class terms. What was it that was excellent in world class terms?
A. Well the fact that they got the category right and the lead time was sufficient, almost one day, that if used properly - I mean there's a gap between - in the forecast out that I don't want to get into, and getting it to the sailors in the right form, we've gone around already. But in terms of the actual forecast, limited by what they could say and minus the gust factors and so on, I don't think they could have issued a better forecast.

Q. What does a storm warning mean to you?
A. As what, sorry?

Q. Well what's the significance of it?
A. It means - out to sea it means - well you're asking me in what capacity?

Q. Well I was asking you really whether are you aware that it is the most extreme--
A. Okay, yeah.

Q. --warning that can be put out by the Bureau for this area?
A. Away from the tropics it's the most extreme warning you can put out, yes. In the tropics you can go - there are a couple of levels higher up into hurricane force.

Q. Why is it that we don't have hurricane force or cyclone warnings in this area?
A. Well we don't get hurricanes or tropical cyclones in this area for a whole lot of reasons. They're just not - they're a tropical and shading the subtropical phenomenon.

Q. Hurricane force winds come in at?
A. At about 64 knots.

Q. So if we had a 64 knot wind in the mid-latitudes concerned with this race, they would still not be classified as a hurricane?
A. No, it's not a hurricane because the structure is totally different. A hurricane is - effectively has a ring of very strong winds around a central core and those winds pretty well universally are of that kind of strength or

higher. In these extra-tropical storms you'll get a quadrant only where the winds are like that.

Q. So one-quarter of the circle?
A. Maybe one-quarter, yeah. A lot of the other part of the storm the winds will be much lower.

Q. Does it follow from that that the winds in the lower latitudes are far more variable and asymmetrical, conditions generally are more asymmetrical?
A. It's tough to give a one word answer, but if I have to, yes.

Q. Well perhaps can you explain?
A. Well I thought I just did in terms of the - the strengths are usually great - or can be a lot greater in hurricanes anyway, although you can get hurricane force winds in terms of the just the straight numerical numbers, but hurricanes have a much - I mean the whole area is surrounded by winds exceeding that kind of level.

Q. So does it follow then that it would be totally inappropriate to classify these winds in this area as hurricane force?
A. It's again whether you're being loose with the terminology. You couldn't say that the system was a hurricane, no, but the winds got up to - in some parts of the storm they got up to that height.

CORONER: Q. That's not clear to me. You seem to be saying that it's not inappropriate to label certain winds in that area, if they reach a certain force, as hurricane force. Is that what you're saying or not?
A. No, I'm saying winds can get up to hurricane strength--

Q. In that area?
A. Yes.

Q. But the system is not a hurricane because it doesn't have the right kind of structure.

Q. So it would be misleading to call them hurricane force winds?
A. Yeah. I mean I can certainly think of another term, but not a hurricane.

STANLEY: Q. I want to turn to the question of forecasting wave heights. You've indicated there were difficulties for the forecasters with winds. What about waves?
A. I'm not trying to dodge the issue here, but I'm not a wave expert.

Q. But you understand?
A. I run wave models. Here's the funny - I guess not funny, peculiarity, in that I do run wave models and I produce numbers out of those that give wave heights, but I'm not a wave - I don't know a lot about the dynamics of waves.

Q. Well are you able to say that it's not just a matter of pressing a button or looking at what's shown on a particular model and simply saying that's necessarily the wave height? There are other factors that have to be taken into account by the forecaster?
A. Yeah, like where the winds are, what the depth of the ocean is, what - whether it's sheltered. All kinds of things. What the fetch is. There are a lot of factors involved in it. What the swell is.

Q. Are you able to tell us what the difficulties are facing a forecaster in predicting wave heights?
A. Not all of them, just some.

Q. They're the matters you've just mentioned?
A. Yes.

Q. You have a particular model is it? What's the difference between your model and the others that are used by the Bureau, the ones we've heard about?
A. Well the bureau has a responsibility for the entire globe to produce forecasts twice a day. It's a commitment, it's part of their charter, and also for a large part of the Australian region. So groups like myself are trying to - we forecast for much smaller areas, so we fill in that gap.

Q. So does that mean that your model has a higher resolution?
A. Yes, that's correct.

Q. What's the resolution? What's the gap for yours?
A. At that time - the gap is pretty well closed now, but when that race was on I think it was - well we were running at 10 kilometres and I think the Bureau's forecast was a 25. That's a fairly significant difference.

Q. Perhaps could you just explain what those distances mean?
A. Okay. The area over which you're doing a forecast is divided up into a grid, like this. And at each of those points a forecast is made advancing forward in time, and in our case the points are a lot closer together, so for every point in the Bureau's model at that time we've got two and a half times as many in one direction, two and a half in the other. Multiply those together and you've got almost seven times as many points, you know, in a given grid box.

Q. So does that mean that your model was able to give a seven times more detailed picture?
A. No. What it - if it was as simple as that it would be good. It means you expect it to capture more detail. More is - has to be qualified depending on the amount of structure that's there anyway, but you would expect - again there's no particular rule of thumb, it depends on the situation, but you'd expect it to - if there were stronger winds around and the potential for stronger winds, I'd have a much greater chance of picking those up.

Q. What's the down side of your model?
A. The computation cost.

Q. I'm sorry?
A. The computation - the cost in computer time to run it meant that, as I said, I couldn't finish it in time for the briefing in the morning. All I could do was take out some point values.

Q. So your computer - the model you have takes a lot longer than the models used by the Bureau?
A. Yes, yes.

Q. Would your model, as it was at the time of this event, was it suitable for daily use by the Bureau in putting out its forecasts or did it take too long?
A. At 10 kilometres, no, it wasn't suitable.

CORONER: Q. But now?
A. Now the Bureau is running it at that kind of resolution because they've got a - they've since acquired a very powerful super-computer.

STANLEY: Q. Do you have a different model yourself now?
A. Yes, I do, and I've gone down further in resolution.

Q. What are you at now?
A. We're down - well it depends what we're looking at, but for say pollution events or whatever around the Sydney area, we're down to around a kilometre, even below in some cases, 500 metres.

Q. Professor, since this race, have you engaged in further research in light of the information that's now at hand as to the conditions that were experienced during the race?
A. Yes, I have.

Q. Can you tell that to us? What work have you been doing and with whom and for what purpose?
A. Soon after the race finished, we decided to investigate it further.

Q. Who's we?
A. Sorry. Myself and a Bureau officer who just recently left the Bureau.

Q. A senior Bureau officer?
A. Very senior, yes, Bruce Buckley. The paper has now been accepted, subject to some revision in one of the international peer review journals, and we took the case - we took the case study because it was a rare event and clearly one of enormous significance in terms of--

Q. When you say it's a rare event, what was the rare event?
A. Well the formation of the east coast low at that time of the year. Well very uncommon. I don't want to - I don't want to say rare because that indicates maybe one in a hundred years. That's not - they're uncommon, very

uncommon.

Q. So you wanted to study that phenomenon did you?
A. Yeah, that's part of what we do is look at the very uncommon events because they're quite often - as you can see in this case, they're tied up with major catastrophes, and trying to understand why that system developed. It was a two-fold thing, to see - the main aim was to see how far ahead and we started off three days back, then two days back, then one day back, to see how far ahead that event could have been predicted with the best possible model formulation and data that we had.

Q. So with hindsight, you go back and looking at--
A. Correct.

Q. --all the material that was available, all the models, what's the earliest it could have been picked up?
A. Yeah.

Q. What was the answer?
A. The answer was pretty well what I said before, that the run that we did on the morning that I went in, when we re-ran that case we got storm force winds but they were at resolutions of five kilometres, and no model in the world in any operational centre was running even close to that in 1998.

Q. At that time?
A. Yes. That kind of information was not available.

Q. So does it follow that in light of this more updated and advanced equipment and with all the observations being put into it, the result in effect is the same or confirms the forecast in terms of the time it was given and what was said?
A. Yeah. We got an improved prediction but the timeliness, the lead time, was similar.

Q. You mentioned I think there were other purposes were there?
A. The other aspects are the basic research aspects of what factors are contributing to the storm's development.

Q. As part of this work, did you make assessments of what wind speeds were shown by the models, looking again with retrospect?
A. In my model?

Q. Yes, in your model and--
A. As part of this study?

Q. Yes.
A. Of course, yeah, that was one of the key things.

Q. What information did you feed into your models when you were doing this research to determine what the wind speeds were that should have been or would have been predicted?

A. Well in fact because we were trying to simulate what was possible in operational conditions with the best available models, we used exactly the archived real time data, so no additional data than was available back on that date.

Q. So you had the actual real time data?
A. Yes.

Q. Put it in with these new high resolution studies, models and so on?
A. That's correct.

Q. What result did you get in terms of the wind speeds for the relevant area?
A. We got up into the fifties, so around about 57, 58 knots.

Q. So does that mean that was the significant wave height, the maximum significant wave height?
A. No, we're talking about winds, sorry.

Q. I'm sorry, I beg your pardon. Maximum wind speed.
A. That's maximum sustained winds.

Q. And that's the average wind over a 10 minute period?
A. That's correct.

Q. The same as is used in the Bureau's forecast?
A. Exactly.

Q. So does it follow then with all the information that was available and even with this updated equipment, your study revealed that the estimates in fact given by the weather bureau were very very close?
A. Yeah, that's true.

Q. Has the same thing been done with respect to wave heights?
A. I haven't done it, no. Somebody else may have, but I don't know.

Q. You mentioned before you're currently doing some research involving wave heights are you?
A. That's correct and this is one of the storms we're going to look at once we get the - we're into the first year. We got a - I got a grant with a colleague at the University of New South Wales to work on this kind of problem and we're just in our first year of doing this kind of work, so it's a bit premature yet.

Q. What are the sort of things that you expect to be looking at in determining wave heights? Is it again just a matter of looking at computer models?
A. No. We've got through my colleague and resources in the United States quite a lot of observational data from some of the storms they've had as well. They've had a couple of major storms that you may or may not have heard about, the storm of the century and so on, that affected the United

States in the nineties, plus this Bass Strait storm that we want to look at to see what the model does in terms of wave heights, and our particular interest in high winds and breaking waves at sea.

Q. Professor, are there persons to your knowledge in Australia who can properly be regarded as wave experts?
A. Yes, yeah, certainly, but I don't know them all because I'm not part of that wave community. I'm just moving into that now.

Q. What sort of people are they? What qualifications?
A. The only ones I know, and it's more a reflection of I guess my narrow view at this point in time, tend to be at the University of New South Wales or one or two in the Bureau and people overseas. But that is - that's far from - that's a very restricted view.

Q. What discipline are they in?
A. That's - they're mainly in - they're either engineers or mathematicians or oceanographers, they seem to be in those three groups. Or some in private practice too.

Q. Well from your reading and your general knowledge of the area, what do you say as to the state in which research into wave height studies has been done?
A. Well for this particular area which is the one - the first one that I've taken a really active interest in, it's very early days. Again I'm just repeating that it's strong - very strong wind conditions and breaking waves at sea, that's the area that we're focussing on, not only as a result of this particular storm but we'd already started looking at that before the storm even occurred. This was an area we were interested in.

STANLEY: Thank you.

HILL: Q. Professor, what I want to ask you is about this. Some of those wind speeds were equivalent to speeds that we find in hurricane force winds. Is that not correct?
A. Yes, that's correct.

Q. So that the speed itself of the wind was of the same force as a hurricane?
A. Yes.

Q. But we don't call it a hurricane because it's a different system that produces hurricanes?
A. Yes.

Q. Is there anything wrong with putting out a forecast, especially when it's not to the international community but to just this room, to say that the force of these winds would be the same as the force of winds you would meet in a hurricane?
A. I personally would have no problem with that, if it helped the understanding.

Q. Yes, to help you understand.

CORONER: We're thinking of course of the personalised forecast for the yacht, for the fleet.

HILL: Yes.

CORONER: Not beyond that.

WITNESS: If that brings home the message, yes, I would have no problem.

HILL: Q. And I suppose, to take it a step further, the force of the winds that were encountered in Bass Strait would be the same speed as we sometimes encounter in cyclones in northern Australia, is that right?
A. Only in weak ones, because if you go back to the definition again, for hurricanes, with more tropical storms you've got to be above this threshold value, and the forecasts--

Q. It's just that as a community we were educated to understand cyclone means something quite devastating.
A. Yeah, but what I don't know is if - sorry, what I don't know is if there were sustained winds of hurricane force in the storm. I haven't seen anything in my modelling that says so, but there may observations that said so but--

Q. I accept that, but if we got into gusts, we could actually say gusts equal to hurricane force winds, within this group here, to help explain it. Do you have any problems with that? There's no trick or anything in this.
A. I know there's no truck, but you're then saying - what you're really doing then is saying wind gusts in one system, you're equating those with sustained winds of another, so I don't think that's too good. But I don't have a problem with - as you say, if you're trying to bring home a point about how fierce these winds are, saying that they can reach hurricane force at times, that doesn't bother me, but making it too much like a hurricane does bother me.

Q. I understand. But once again, accepting that we're in this small group as it were, we're not the outer world at large, but we're really trying to get a message across to in fact these little yachts, these yachtsmen. We're trying to impress upon them that what you've got ahead of you is really quite devastating. You accept that it's quite--
A. If that worked I'll use it, yes.

HILL: I've nothing further.

STANLEY: Could I just clarify one matter arising out of that question?

CORONER: Yes, of course.

STANLEY: Q. Professor, you said I think that your model did not show any hurricane force winds?

A. It didn't get up to 64 knots anywhere, no.

Q. This is in your post-race analysis and studies?
A. Yes. Any forecast I did, none of them got up to that strength. They got close but not that height.

Q. So does it follow, what you're saying is even if this nomenclature of hurricane force winds was to be introduced, it wouldn't have applied in this storm for the--
A. Not for sustained winds, no.

<WITNESS RETIRED AND EXCUSED

LUNCHEON ADJOURNMENT

<ROGER CHARLES BADHAM
ON FORMER OATH, EXAMINATION CONTINUED

STANLEY: Q. Mr Badham, what did you do over lunchtime today?
A. I bought a banana and I was interviewed by the ABC.

Q. Interviewed by the ABC?
A. That's right.

Q. You consented to be interviewed by a journalist from the ABC did you?
A. That's right.

Q. And were you recorded live?
A. I was recorded I think.

Q. Where did that interview take place?
A. I don't know. Outside.

Q. In the court, in the court precincts, in the court building?
A. I believe so.

Q. Well you know so don't you?
A. Yeah, yeah.

Q. It was just outside the door?
A. Yeah.

Q. Do you regard yourself here giving evidence in the role of an expert to assist the Coroner with your expertise?
A. I hope so.

Q. What was the purpose of you giving an interview in the middle of your evidence to an ABC journalist?
A. Because - because they asked me.

Q. Why did you agree?
A. Well it wasn't - I don't think it was - it wasn't live to air or anything. It was the same as someone just interviewing you.

Q. Were you asking - were you talking about the matters that you've been giving evidence about before this inquest?
A. Not really, no.

Q. Not at all?
A. Well asked me the same questions that other journalists have asked me in the last year and a half, year and three months since the event.

Q. Were you telling the journalist things that you hadn't told his Worship?
A. No.

Q. I beg your pardon?
A. No.

Q. Well why was it necessary to tell the journalist them again?
A. Say again?

Q. Why was it necessary to tell the journalist things that you'd already told his Worship in this Court?
A. I presume because they like a live interview.

Q. Do you feel that that can be of some benefit to you in terms of publicity?
A. No, I don't.

Q. Getting more work perhaps?
A. No, not at all. If someone asks, I fulfil the request. If someone doesn't ask, I don't. I don't think I've ever turned anyone down.

Q. It didn't strike you as inappropriate for you to give an interview whilst you were effectively in the middle of giving your evidence?
A. Well not that I was relating to anything about the evidence as such, no.

Q. I want to take you Mr Badham to your weather notes that were issued by you and presumably given to those 22 boats that you had a professional relationship with. Do you have a copy of your notes?
A. Not on me, no.

Q. Do you have some in your bag?
A. I would have over there.

Q. It might be easier if you--
A. Could you excuse me while I--

STANLEY: Could the witness leave the box to get his notes?

CORONER: Of course.

STANLEY: Q. Mr Badham, this was a report you've told us that you wrote through the night of 25 and 26 December?
A. That's correct.

Q. The whole report was done over that period from beginning to end?
A. No, I think - I'd have to check through it but the background material, just putting in a couple of things about waves and the background, the maps and coastal observation reports, they would have been done on Christmas morning or something like that.

Q. But at all events, as far as you were concerned, you were happy with it in the sense that it was in your assessment the best outlook you could give at the time it was given to the yachts on Boxing Day morning?
A. Incorrect.

Q. Incorrect in what respect?
A. Well because I think, as I alluded to yesterday, the notes were written primarily between - I'd say between 1 - probably 2am and say 4 or 5am and I put them together and that time, and subsequent to that the US model came in where it was showing stronger conditions, and I was to-ing and fro-ing, I couldn't go back and change them but it was - I was happy with the general tenor of the notes, but I had updated information which said that it could be - it could be more - there could be more wind. That's--

Q. Mr Badham, were you happy with these notes or were you not?
A. It's a difficult one but--

Q. Would you hand out notes to the people that engage you and pay fees to you that were not accurate in your assessment?
A. They're never - that's a very grey area. I would hand out notes saying hey look, this was written now six hours ago, and I'd point out for instance that now I think that that might be up a little bit or down a bit. That's why I go the yachts and I spend five, 10 minutes, 15 minutes with them and I say this is where I put emphasis, this is where I wouldn't put emphasis.

Q. Now would you answer my question?
A. Yes.

Q. Would you hand out notes to the persons that pay you for your services that you were not totally happy with?
A. Well yes, I would, because I would - as you just heard, because I would orally update them and correct them.

Q. Would you expect those that you were giving the notes to, to correct them?
A. At least because I sit with them while they do it.

Q. What about the people that you don't see, the ones that your wife takes the notes to?
A. Most of those people I've spoken to by mobile phone.

Q. On this occasion did you?
A. Yes.

Q. With every one of them?
A. Yes. There was three of them - there were three of them.

Q. And what did you tell them?
A. In fact that was--

Q. What did you tell them?
A. I told them about the model output, I told them about the gale warning from the Bureau, because one of the yachts I didn't speak to until almost before the start of the race and he contacted me by mobile phone, I think it was about 12.30, and I went through again the situation. I was still at the club and went through as I had done with yachts on the - you know, with the people where I sat down with them, and I went through each page with him, you know, for I think it was probably 10 or 15 minutes on the mobile phone and did the same thing.

Q. When did you commence giving out these weather notes, what time?
A. Eight-thirty.

Q. And when did you find out about the gale warning?
A. I can't be sure but I'd say probably around 9.30 some time. Some time, a quarter past nine, something like that.

Q. How did you find out?
A. I found out because one of the - I - when I go to the yachts I make sure that they go and get the weather bureau package.

Q. How did you find out?
A. And one of the yachtsmen came back and said "I've just been to the stand and the weather bureau's brought out a gale warning."

Q. So if the weather bureau hadn't put out that forecast for a gale warning, your yachtsmen would have gone off, sailing away without ever knowing about it?
A. I don't follow what you mean.

Q. If it were not for the weather bureau putting out the gale warning and you finding out about it from one of the yachtsmen, your customers, your clients, would have gone off sailing in this race with your weather notes and have no idea that there was a gale warning?
A. Well I don't issue gale warnings. I issued forecasts where I had winds of gale strength.

Q. Well let's just look at what your overview was. You'll realise of course that this is a document that you're handing out on the day of the race, not two days earlier in a pre-race briefing?
A. Yes.

Q. Would you just read the very first line, the very first--

A. Sure. "This is a typical Hobart race with a southerly change, but this one is one of the most difficult in recent years to accurately pinpoint the wind changes due to an intense low that looks set to develop near Tasmania."

Q. Do you still say that it was correct to describe it as a typical Hobart race?
A. I said - well it depends, it depends--

Q. With the wisdom of hindsight, is that a correct forecast or overview that this is a typical Hobart race?
A. It's a typical Hobart race in the fact that there is a southerly change.

Q. What do you say as to whether or not this was a typical Hobart race?
A. It's a - the word typical there was meant to interpret the southerly change. There is always a - no, I shouldn't say always. There is most frequently a southerly change and this was yet another one, and it's qualified by the fact that it's "most difficult in recent years" - "most difficult in recent years to accurately pinpoint the wind changes due to an intense low that looks set to develop near Tasmania."

Q. On Sunday the 27th, in your overview you did refer to the low pressure system. In your overview you were putting it south-east of Tasmania. Is that so?
A. Yes.

Q. So you expected the low, if it were to form at all, to form south-east of Tasmania?
A. Yes, in that - that--

Q. Is that correct? Is that what in fact happened?
A. No, it's not, not at all.

Q. Not at all?
A. No.

Q. Did your notes, weather notes, include any reference to wind speeds of 40 knots or more?
A. No, I went to 40 knots.

Q. So the highest speed you mentioned was 40 knots?
A. That's correct.

Q. Can you show us where that is?
A. On Sunday, south-west 20 to 30, increasing west sou'west 30 to 40 to max out later in the day.

Q. When you say to max out later in the day, what you're saying is that the winds are going to die on that Sunday afternoon?
A. No, I say they're going to increase Sunday afternoon, they're going to max out. That's maximum.

Q. Well under the heading what might go wrong for that same day, you make reference to the winds really dying. Is that

not so?
A. If the low forms further to the south-east of Tasmania, then the thing won't be as intense and then the winds would die.

Q. Well in fact it didn't form over there at all did it?
A. No.

Q. Did you in your notes make any reference at all to wave heights?
A. Yes. Not in these notes, no. I had a separate issue.

Q. A separate issue do you?
A. Yes.

Q. What, written notes?
A. Yes.

Q. Have they been produced before?
A. I don't believe so. I didn't give this to the court. I don't know where the court got this.

Q. What are the additional notes?
A. They weren't additional. I had - if you see the way I do the forecast, you'll see the way in which the forecaster structured it has the winds and then it has the current and then it has the weather information and then it has weather charts, and there was also some wave information which I did late and photocopied off, because I think if you recall, I talked about the fact that I couldn't run the wave model or the wave algorithms that I have on the latest data, and I ran them on earlier data very late and I took them in as well, yes.

Q. Mr Badham, the weather notes that have been produced before this Court, do they have any reference at all to wave heights?
A. No, because they're done on a separate piece of paper, on a separate--

HILL: I've just been instructed that in fact these notes came from we think a Mr Kemp who is a yachtsman. We have never had notes from Mr Badham as such

STANLEY: Q. You know Mr Kemp, Steve Kemp?
A. Yes, sure.

Q. Is he one of the persons that received your notes?
A. Yes.

Q. I suggest he sent a fax to the police assisting the coroner with a message, "The following is Roger Badham's forecast that he gave us for the Sydney to Hobart" and that's the document that's been produced?
A. That was in together as one document, yes.

Q. Do you say there's an additional document is there?
A. I had an additional chart with weight heights on it, yes.

Q. Where is that?
A. That was given to the yachtsmen as well.

Q. So Mr Kemp has made a mistake has he in not forwarding that document?
A. He may have.

Q. Do you have a copy of it?
A. At home I would somewhere. I keep all the documents.

Q. Do you have a copy of your own report there, your own notes?
A. Not on me here no, but I do - These ones are from the whatever.

Q. You went to your own bag before?
A. Yes.

Q. Did you not get the notes from there?
A. Yes.

Q. So those are your notes?
A. Yes.

Q. That were handed out to the yachtsmen?
A. Yes.

Q. And you say there's an additional page?
A. Yes.

Q. Why isn't it with you?
A. Just because it's not.

Q. Didn't you think it might be relevant?
A. I'm sorry I just didn't - I'm sorry.

Q. Are you now telling the coroner that as well as the notes that you have in front of you you handed to each of

the yachts who were clients of yours an additional page setting out wave heights? Is that what you are saying?
A. Yes.

Q. Are you sure about that?
A. I'm absolutely sure about that.

Q. What wave heights did you say?
A. In terms of wave heights?

Q. Yes?
A. Do you want to know?

Q. Yes that's why I'm asking you?
A. They certainly weren't very big. They were something like three to five metres.

Q. Bit of an embarrassment is it?
A. No, not at all. They were consistent with the sorts of winds that I was forecasting which was 30 to 40 knots.

Q. Mr Badham why didn't you bring that page with you to court?
A. Well I looked at it last night actually when I drew that sketch.

Q. If you'd just answer my question. Why didn't you bring it to court?
A. Well I didn't bring the whole set of folders to court.

Q. You brought your notes?
A. I brought the notes because I knew that they'd been subpoenaed or whatever the word is.

Q. Didn't you think that this page had been subpoenaed also if you'd handed it out to all the yachtsmen?
A. I don't know. I really don't know.

Q. Didn't you even think about it?
A. No I didn't. I worked on it last night.

Q. Didn't you think it was important?
A. Yes.

Q. The wave heights have been such a significant part of the evidence that you've heard in this court?
A. Yes.

Q. Thinking it's important, why didn't you bring it with you?
A. I didn't bring the whole set of folders.

Q. I'm not talking about a whole set of folders, I'm talking about one page of what I suggest to you would be crucially relevant facts or opinions?
A. Yeah, okay.

Q. Don't you agree with that?

A. Well as I say I just don't - I had a whole set of folders on all the different aspects and I didn't bring them.

Q. So you say now you were telling the men on your boat they could expect waves of between three to five metres?
A. Max, yes.

Q. And that meant they could safely sail there with not expecting any more than a five metre wave from Sydney to Hobart?
A. A significant wave height, I'm talking an average wave height.

Q. Yes?
A. That's what I forecast.

Q. Did you tell them about the possible effects of current?
A. Yes.

Q. Did you put it in your notes?
A. I know I discussed it. I don't know if it's in the notes.

Q. Surely you know what's in your notes don't you?
A. No it's a year and a half ago. I'd have to read it. I don't know.

Q. Are you able to tell us whether it's in your written notes?
A. I can't tell you because I'd have to read it.

Q. If it wasn't in there do you say you'd be telling your clients that?
A. I know I discussed quite intensely to each person the - in fact what I told them was that if the winds were soft--

Q. Mr Badham if it would be easier if you answered my question. My question is if it's not in the notes that current must be taken into account in the way you've told this court it should be are you saying you would have told the men on the boat?
A. No. I didn't take into account the effect of the currents on the wave height. I took into account the effect of the currents in terms of the position and the routing of the boat but not in terms of building up the waves.

Q. Precisely, you were taking into account current so that in a way that it might assist your clients to get an advantage or to get the best out of the current in terms of moving their boat faster?
A. That's right, yep.

Q. You didn't touch on the issue of if necessary even doubling the estimated or anticipated wave heights in the event that there was a current of two knots?
A. You're correct because at that time I didn't, as you see by the forecast I wasn't going, I wasn't anticipating an

excessive wind.

Q. But your anticipating five metre waves--
A. Three to five.

Q. --now double those is ten--
A. Three to five metre waves and you don't double them, you add a 40 to 50 per cent maximum. And at that stage it was only a one knot current against. And a one knot current against would be 20 per cent added.

Q. So it takes the five metre up to six and a quarter or thereabouts?
A. Six.

Q. You thought it wasn't necessary to tell your clients that?
A. No, I was concentrating I suppose on using the current rather than keeping out of the current which was what really worried me the next day.

Q. Did you explain to your men either in your notes or verbally what a significant wave height meant?
A. No.

Q. Why not?
A. The same reason I suppose I forecast average winds and I don't tell them about gusts.

Q. What is the reason?
A. I assume knowledge.

Q. You assume they know?
A. Absolutely.

Q. Yes, because you would say any sailor who is going to go in a Sydney to Hobart Race as skipper or navigator ought to know that?
A. I don't know if they ought to know but they should.

Q. That's the same thing, they should know it?
A. Yep.

Q. You're aware and you were aware on this day that the weather bureau forecasts, where they included wave heights, did not take into account the effect of current?
A. Yes.

Q. So that meant in your mind if there had been a two knot current one would have to add 50 per cent on the average wave height, a significant wave height, forecast by the bureau?
A. Absolutely.

Q. Did you say anything about that in your weather notes?
A. Not in the notes. But as I said to you I think certainly on some of the yachts that I briefed where I spent a long time I certainly did go into it. And unfortunately

they just got the benefit of me being their longer.

Q. What do you say you told them, these yachts, what do you say you told them?
A. Well I know for instance--

Q. What do you say I told them?
A. I discussed the current, the fact that it was one knot running down into - past Gabo. I discussed that that would be a useful thing to use. I also discussed the fact that if the breeze was going to be excessive and certainly up to the 40 knots or maybe more because there was a model that was showing more than that, that the sea conditions could be worse and in fact it's common knowledge that you stay out of the current then and you move to either side.

Q. Did you tell them the formula that you've told this court that if it's one knot you increase it by 20 per cent. If it's two knots it's 50 per cent?
A. In several of the yachts where I've worked with these navigators they know the formula and I've worked with them and I would have reminded them. That unfortunately is only a handful of yachts compared to the 20 that I had.

Q. So what, some are getting the advantage of your knowledge and some aren't?
A. Some are getting the advantage of the fact that they just occupied my time for longer.

Q. I suppose that's always likely to happen from past experience?
A. That's the reality of life--

Q. So you know there's going to be some yachts you are not going to have time to explain all these matters to?
A. There's a very finite time and you get in there and you give them the--

Q. All the more reason I suggest to you to put those sort of matters in your notes so that it's there so that your clients will know when they are looking at a weather forecast put out by the bureau and taking into account current, they would have to significantly increase a wave height's forecast, isn't that so?
A. Yes they could but as I said I always suggest that they take the bureau package as well. I think they should look at everything there is available.

CORONER: Q. The question was, when you were only dealing in detail with some yachts isn't it all the more important to put all this relevant data in your package for all the yachts so that the ones who don't get the benefit of the extra time will know what these other ones know that you are telling them verbally?
A. Well yes but it comes to a point of how much do you put in? I mean in terms of the half dozen weather sheets that you have from the bureau do you put every terminology in or not?

Q. Only what you see fit to put in.
A. I take your point, yes.

Q. You don't want information overload do you?
A. No I'm always amazed, because I work with these guys all the time, how much they're read on some boats and how little they're read on others and how much they're used on some and how little they're used on others. It's very, very varied.

STANLEY: Q. Mr Badham just turning to your forecast for Sunday 27th, do you include gusts in your forecast?
A. No.

Q. Why not?
A. Because for the same reason that the bureau - it's a standard practice to forecast the average winds.

Q. I rather thought you were critical of the bureau that on some occasions gusts were specifically mentioned and on other occasions they were not?
A. I was critical in fact that if you are getting to extreme events that you can mention what you think the maximum might be.

Q. Why didn't you do that?
A. Because I didn't think it was going to be a critical event. You can see that I have forecast there gale force conditions.

Q. Do you ever mention the word "gale"?
A. No. I can't say that for sure but I--

Q. I suggest you don't. You are not telling your clients in these weather notes there's going to be a gale are you?
A. Well I'm afraid yeah well the wind speed is gale strength winds.

Q. And it wasn't until after you'd handed these out to most, if not all of the boats, you even knew there was a gale warning?
A. Say that again?

Q. It wasn't until you had handed out most, if not all of these notes that you found out?
A. No. I got there at half past eight. I would have done probably five yachts out of the 20 yachts when I found out that there was a gale warning. At that particular time when I arrived at the club on the Sunday I had been forecasting 30 to 40 knots. Now you see at the same time the weather bureau was forecasting something like what, 20 knots or 20 to 30 knots. I wasn't surprised when there was a gale warning because when I heard that the gale warning had been issued I was expecting it to be issued.

Q. Let's look at what you regarded as the major question for Sunday 27th. Do you see that in your notes under the heading "notes/decisions"?
A. Yep.

Q. The major question here is how significant is the low pressure system south-east or east of Tasmania? That's driving the winds?
A. Yep.

Q. You saw that as the major question didn't you?
A. Yes absolutely.

Q. But for a start you had the position totally wrong didn't you? It wasn't south-east or east of Tasmania at all?
A. Absolutely, as with all the models.

Q. You then go on and you say "Will it race away to the south-east and moderate the winds quickly or take until mid to late 28th for this to occur???" and then you've got three question marks?
A. Yes.

Q. It's a very different task that you've got to the task of the forecaster with the weather bureau isn't it? He can't put question marks at the end of what he wants to say?
A. Well he should if he's doubtful.

Q. Are you suggesting that would be an appropriate way to make a weather forecast?
A. Probably not but it does show doubt doesn't it?

Q. While we are on forecasting, you said before that you were a forecaster for the Sydney to Hobart Yacht Race for a number of years?
A. Only a few years.

Q. How many years?
A. I think three.

Q. Are you sure about that?
A. No I'm not, two or three.

Q. One or two?
A. No I--

Q. One?
A. No. Is it? I think it was more than that.

Q. Why in fact did you give up or why didn't you do it since?
A. Because as I recall the last one I did was probably 1990 and the following year and the following five years I was in San Diego with the Americas Cup.

Q. Are you saying the last one you did was 1990?
A. I think, yes. If they have records then go for it because I - I believe it was 1990.

Q. Have you ever worked at the Weather Bureau?
A. No I haven't.

Q. Have you ever had the training to be a weather forecaster?
A. It depends what you call by training. I worked for six years with a person who was supposedly the most respected aviation forecaster for gliders in the world.

Q. Have you ever been trained in the weather forecasting that is in accordance with the international conventions applied by and applicable to the Australian Bureau of Meteorology?
A. I have done the equivalent working for this man, yes.

Q. So you are familiar with the international conventions are you?
A. Pretty much, yes.

Q. Are you aware of the restrictions that are imposed upon weather forecasters and the way in which they express a forecast?
A. Absolutely.

Q. Just going back to what I was asking you before, you've said that you would have told some of the crews about the gale for example. Which crews did you tell about the gale?
A. When you say the gale?

Q. This is before the gale warning?
A. The whole briefing that morning was in terms of is there going - not even is there, there's going to be a gale but is it going to be worse than that or is it just going to be 30 to 35 knots? Is it going to 40 to 45 knots? That was the major question of the day.

Q. Mr Badham I may be wrong, my recollection is that not long ago you said that you had told crews, people on the boats, there was to be a gale, before you got the gale warning?
A. Yes.

Q. Who did you tell that to? Which boat?
A. I can't recall which order the boats were in, I'm sorry.

Q. Which people did you tell? Who did you tell?
A. When I went to the specific boats and sat down with the crew I went through and said this is the situation.

Q. Can you tell us any person at all that could say "Yes I was told by Roger Badham there was going to be a gale or gale force winds before a gale warning came out?
A. I'd have to go back. If I could go back to the notes and I could tell you who the first five boats were and then I could tell you but apart from that no I couldn't.

Q. Well if you're coming back to this inquest on a subsequent date would you mind in the meantime checking that out so you are able to tell us who you did tell that to?
A. Yes, that's not a problem.

Q Would you also mind bringing the additional notes that you've not included with the notes that are with you today in relation to wave heights?
A. I can do that.

Q. Since this event Mr Badham you've been quoted considerably in the media have you not?
A. Well I - by a number of journalists who have contacted me I certainly haven't contacted them.

Q. My question is since this event you've been quoted extensively in the media. Is that right or wrong?
A. I don't know if extensively is the correct term.

Q. You've been quoted in the media?
A. Yes.

Q. Have you had any occasion to correspond with any journalists or media people or even authors in relation to the events?
A. Yes. I mean there's quite a number of people who've contacted me both by phone and also by e-mail.

Q. I'm asking about what letters you've written? Have you written letters?
A. I don't think I've written a letter. I've replied with some e-mails yes.

Q. Do you have copies of those e-mails?
A. I would do but not here.

Q. Would you mind bringing those also with you when you come back?
A. Sure, what everything or--

Q. Since this event have you ever written a letter to the newspaper about it?
A. Only this year in refute of another letter that was written to a newspaper.

Q. Would you mind bringing a copy of any correspondence that you've had with the newspaper in relation to the events we're concerned with here?
A. Sure.

Q. Is it correct that when you were on one of your boats and I say your - your clients' boats on he morning of the race that you got a phone call from Mr Mundle, the journalist?
A. That's correct.

Q. He was ringing you to find out what was happening, what the update was in your opinion?
A. That's right.

Q. I note - is this clear that I got it correctly, did you say to him it looks like 40 knots?
A. Yeah, max, yeah.

Q. After you'd finished giving out your notes and talking to your crew and the race started did you go straight home or did you stay at the yacht club?
A. I was at the yacht club till probably about 12 or 12.15.

Q. Did you eat there?
A. I think I had a quick sandwich or something.

Q. Were you by yourself or were you mixing with the yachtsmen or anyone with the committee?
A. No.

Q. What just by yourself?
A. Yeah.

Q. Then you went home?
A. Yes.

Q. At that stage no idea of any storm warning?
A. No, well it wasn't even put out then.

Q. But you weren't anticipating one?
A. Well no I wasn't anticipating a storm warning, no.

Q. When you did get home and you saw the new output on whatever models you had you thought oh dear it's showing 45 knots mean speed?
A. Yes.

Q. So five knots more than it had been a few hours earlier in your opinion?
A. Yeah but they were showing that - I mean the models that were run for that afternoon were showing consistently 45 knots for quite an area across Bass Straight and earlier in the day it wasn't looking anything quite - I was showing 40 knots max and you know as I say 30 to 40 knots so it was definitely looking much worse.

Q. When you gave your evidence I suggest what you said it was now 45 knots whereas before it had been 30 to 35 in the morning. Is that correct?
A. Thirty to 40 I thought was the--

Q. Maybe I got it - it's my note that's wrong?
A. Yes.

Q. But in all events it was sufficient for you to consider you'd better ring Mr Mundle?
A. Yes.

Q. Why was he so important, a journalist?
A. He wasn't so - I certainly don't want you to get this wrong. He had contacted me virtually very day for the previous five days asking "Are they going to break the record? Are they going to break the record? What's going to happen? What's going to happen?" And I'd consistently told him "Look there could be a low pressure system but I don't think it's going to be that bad, I don't think it's

going to be that bad." And then just after the start of the race hey it is going to be pretty bad.

Q. Before the race started you knew there were going to be gale winds?
A. Thirty to 40 knots, yeah.

Q. And a gale warning had been issued?
A. Yep.

Q. And you must have known Mr Mundle would know about that?
A. I presume so.

Q. So what more were you telling him?
A. I was telling him that it was going to be at least five or maybe even more knots stronger than that.

Q. You already knew there was a gale warning. You knew or believed that he would have known there was a gale warning but you took it upon yourself and thought it was necessary for you to ring him and tell him that the winds on your model now might be going up to 45 knots?
A. Absolutely because it wasn't just on a model it was on all models and it looked much more consistent than what it had looked even earlier that morning and it was - I mean not just 45 but in fact I think there was one wind factor there that was damn near 50 but anyway it was 45 knots right across the area.

Q. In all events it was sufficiently significant for you to ring him and you then said I suggest that it was a real worry to you now. The Australian model was showing such intensity for the first time?
A. Well it was. It was showing - I mean the Australian model--

Q. Sorry can I just ask you this? I want to clarify your answer. When you said the Australian model is showing this for the first time, did you mean the first time that you've ever seen something like this on the Australian model or the first time that day or--
A. No that was the first time the Australian model had shown it for this event. Previously the Australian model had been consistent with it being either east of Tasmania or south-east of Tasmania and on that particular run it showed it in eastern Bass Strait.

Q. Did you at that stage know that a storm warning had been issued?
A. I don't know at that instant. I may not have known.

Q. How did you find out?
A. Off the internet, yeah.

Q. When?
A. It would have been some time during that afternoon but it would have only been down loading - after I down loaded that I would have down loaded the data and the forecasts and

everything just to keep a copy of it and obviously when I down loaded it I would have read it and I would have known. But that could have been 3 o'clock but I can't tell you the time. It was after I'd looked at the models and it was probably - I can't even tell you the time because it took me more than an hour to find the phone number to ring Mr Mundle.

Q. What you were really so concerned you spent over an hour looking for his phone number?
A. No I didn't look for the number. I didn't have his number. I'd never rung him before and I rang a friend and said "Do you have his number?" and then they got back to me.

Q. Did you try to ring your clients on their boats before or after you found out a storm warning had been issued?
A. I think it would have been after.

Q. Didn't you think they'd find out?
A. I hoped they did.

Q. You would know they would wouldn't you?
A. I hope they would, yes.

Q. You would know. I mean these boats had every form of access available to weather reports?
A. Yes.

Q. Why was it necessary for you to even think of potentially or possibly breaking race rules to ring them?
A. Well first of all I didn't intend to break race rules in terms of offering outside assistance. My concern was for two of the yachts particularly that were brand new that they should be actually aware that the winds were going to be stronger than what I had forecast and stronger than what was generally conceived when we'd been discussing things either that morning or in previous mornings.

Q. Which boats were they?
A. Wild Thing was one of them and I'd have to check but it was one of the other smaller boats that was new.

Q. So they're the only ones that you rang?
A. Well I rang--

Q. Do you say they are the only ones you attempted to ring?
A. They are the only ones I attempted to ring, you're correct.

Q. Are you sure about that?
A. Absolutely sure.

Q. This was before you knew a storm warning had been issued but you believed the winds could be up to 45 knots?
A. I said I'm not sure whether I knew the storm warning had been issued or not but I'd seen the model output and the situation was looking windier and more severe.

Q. Was it what you saw on your model output or was it the fact that a storm warning had been issued that would have excited you to the extent that you were prepared to contact these yachts?
A. It was the model output. As soon as I saw that model output my heart sank. It was fairly strong.

Q. Up to 45 knots?
A. Yes.

Q. And 45 knots in your mind was sufficiently dangerous that it could cause real damage to two of your yachts?
A. I thought they should be aware of the fact that it was there.

Q. The reason for that is because you thought a 45 knot wind in that area they were going into would be sufficient to cause damage to their yachts?
A. Yes, if it's a brand new yacht.

Q. Even if it's an old yacht?
A. Sometimes the brand new ones are even worse.

Q. Are you saying that Wild Thing was a brand new yacht?
A. To some extent yeah. It was about a month old I think at the time or two months old.

Q. And the other one?
A. I'm still trying to remember. It was a smaller yacht. B52 comes to mind but I don't think I tried to call them.

Q. What do you understand the rule to be against or relating to contacting yachts at sea?
A. Well certainly it comes to a little bit of a grey area in the end but it's certainly not allowed to offer outside advice in terms of the yacht gaining an advantage over the other yacht in terms of weather information.

Q. And what you were supposing to tell these yachts I suggest would have been in breach of that rule?
A. I would absolutely argue against that. I would suggest that I was alerting them to the fact that they may in fact find conditions quite extreme for that yacht and that they should think about what they were doing. I certainly had no intention to relay any information in terms of the positioning of the yacht, anything about the weather or anything else and I certainly would never do so.

Q. You were going to tell them about the weather. You were going to tell what had been forecast?
A. I was going to tell them that the conditions forecast looked quite extreme and that they should monitor the weather even more diligently than what they normally do.

Q. But that's telling them about the weather. That's giving them outside advantage is it not?
A. I don't think it is because there's also a rule that says that you should make sure that all yachts are safe.

Q. Right, that's exactly it. You at that stage took the view that this situation was such that this yacht was in danger, its occupants were in danger?
A. No it wasn't in danger. I said potentially and I think they should go in with their eyes open. But I couldn't contact them anyway. It was merely an intention.

Q. How many attempts did you make to ring them?
A. I can't recall but I'd say two or three times.

Q. Why couldn't you get through?
A. Because normal situation. They were either out of mobile range or they had them switched off anyway. And so they should.

Q. If you knew they should be off what were you doing trying to ring?
A. Sometimes they don't have them switched off I would presume. I don't know. I just thought I should try.

Q. With that concern did you again contact Mr Mundle?
A. From memory not that day no.

Q. I suggest to you that you spoke to him - that you've said in the past that you'd spoken twice to him that day?
A. I don't know. I can't recall whether he called me or I called him but I think he might have called me. I think what happened was I alerted him to the fact that there was going to be - you know that the models were looking pretty grim and I think what happened then was he got back to me later that afternoon.

Q. And again on the Sunday you had two conversations with him again?
A. Same way again. Yes, I actually tried to contact him that morning when obviously the overnight run of the models was confirming everything that was going to occur and also that the reports from Wilsons Promontory were looking quite extreme. I called the mobile number that I'd called the day before. It didn't answer. I left a message on his answer machine or whatever it is.

Q. What's in it for you to be chasing Mr Mundle with this advice or this information?
A. Basically for me not the publicity. I wanted as I said he had contacted me several times. Anyone that contacts me I try and fulfil the situation that they've done. I do that with anyone that contacts me.

Q. Just one other matter Mr Badham. You did not demur before when I put to you that you understood that you were called as an expert to give expert opinion and evidence to this court. You agree you are an expert in the matter that you give evidence about?
A. I have some expertise in it.

Q. When it comes to the estimating or assessing the height of a wave when one is given the height of the sea wave and

the height of the swell what do you say you do?
A. I said if you want to get the maximum you can add the two together.

Q. Is this what you are saying that if you've got sea waves and swell to find out what the maximum will be you simply add the two together?
A. I said if you want to get the maximum possible wave, yes you can add them together.

Q. That's not the correct formula at all is it?
A. No it's not.

Q. No, it's very different isn't it?
A. Yes it is.

Q. What is the correct formula?
A. You take the RMS value and you add the RMS values, the root mean squares.

Q. So it's the square root of the sum of the squares of the two?
A. Yes, effectively.

Q. But you would know would you not that yachtsmen do not do that as a matter of course, they simply add the two together?
A. Absolutely.

Q. Do you ever tell your yachtsmen how it should properly be done?
A. I certainly, in courses that I used to teach I'd show them how to do it properly and with yachtsmen that I've worked with for a long period of time I would. But in a situation again like this no.

STANLEY: Your Worship there are some other matters that I desire to put to this witness. They arise principally out of his evidence this morning and they are matters to which I am endeavouring to obtain instructions and I would appreciate the opportunity to get those instructions before completing my cross-examination. Sorry if that inconveniences Mr Badham but I'm afraid it's something that happened.

CORONER: We'll be stopping in about half an hour anyway I suppose but it is inconvenient for him to have to come back on Monday no doubt. In all the circumstances I'll allow it.

HIS HONOUR: Perhaps Mr Badham could just stand down while I find out what the situation is. Could I say this Mr Coroner that the situation as far as witnesses are concerned that it is hoped on Monday morning and I will check with Mr Badham about this that his evidence will conclude.

CORONER: I take it Mr Stanley the evidence of Mr Badham - it will be a fairly short session?

STANLEY: Yes it will sir.

CORONER: If we can bank on that, we're trying to reign in the inquest. This has taken a little longer than we anticipated but I think we've ended up reasonably soundly. Others may not agree.

WITNESS STOOD DOWN

CORONER: We have plans to get onto Winston Churchill after a couple more witnesses, Mr Love and Mr Dunda who has been mentioned in dispatches a bit. I suppose if we give the Monday over to them.

HILL: I've got on standby Mr Richard Winning and Mr Stanley.

BENCH: That's good because if we can start them we will. That's the Winston Churchill. Our plan is to go through the Winston Churchill story next.

HILL: We intend to deal with the Winston Churchill, the business Post Naiad and the Sword of Orion. That will take place next week. In regards to that I have a main chronology and a chronology of the events that took place on each of those vessels. You have a copy of those already Mr Coroner and I will hand those out to my learned friends so that everyone is prepared.

CORONER: I am hoping that the evidence involving those won't take quite the length of time this evidence has taken but the best laid plans. And then we go onto the areas of various other issues to do with harnesses and life rafts and things like that, rescue and finally we'll deal with the issue of the CYCA officials.

HILL: Yes sir.

CORONER: We'll get through as much of that this month as we can. My proposal at the end would be to allow a brief time at the end, a month, three weeks for brief written submissions, positive submissions, focusing on the future but not only on that of course. And then another short time for me to bring in a finding and recommendations, if any, so that anything this court has done I hope will be done properly but it will done importantly well before the next Sydney to Hobart Yacht Race. The complicating factor of course and I suppose we may as well mention it now Mr Hill is that if we don't finish the evidence in this session we are going to have to set a little time aside later in the year. I would be looking at the last two weeks of June and the first two weeks of July at this stage so you are all on notice. It's a tight frame but I know but there are many other cases I've got to do. I thank the bar table for their assistance during the week.

ADJOURNED PART HEARD TO 10.30AM 20 MARCH 2000

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CERTIFICATION OF TRANSCRIPT

We the undersigned being Sound Reporters do hereby certify that the within transcript is a correct transcript of the depositions sound recorded at the State Coroner's Court, Glebe in the matter of Inquest into the deaths in the 1998 Sydney to Hobart Yacht Race on Friday 17 March 2000

PART HEARD

Dated at SYDNEY
this day of MARCH 2000

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