

## **Contents**

Order of Appearances .....	1
Northern Gateway Panel 2 .....	1
Examination by Ms. Karen Campbell for the Coalition (continued).....	1
On insurance amounts for clean-up costs .....	2
The safety of double-hulled tankers.....	2
Behaviour of spilled dilbit and condensate.....	2
Sediment interaction with spilled product .....	3
Weathering and viscosity of spilled product.....	4
Dispersant use and spill clean-up measures.....	5
Limitations to recovery efforts.....	5
NGP’s 10,000-meter spill models.....	5
Wildlife recovery in the event of a spill.....	6
NGP’s commitments over and above regulatory requirements .....	6
Examination by Mr. Neil Patterson of the National Energy Board .....	6
Examination by Mr. Dave Shannon of Douglas Channel Watch .....	6
Reliability of data from weather stations along the coast .....	7
The role of salinity content in water .....	7
The challenge of bringing in spill response experts during extreme weather events .	8
Examination by Ms. Cheryl Brown of Douglas Channel Watch.....	8
Adequacy and Accuracy of NGP’s models .....	8
Recovery of biodiversity following a spill.....	9
Oil deposition and sediment.....	9
Condensate spills .....	10

## **Order of Appearances**

### **Northern Gateway Panel 2**

#### Marine Emergency Preparedness & Response

Mr. John Carruthers	Mr. Randy Belore	Mr. Jeffrey Green
Dr. Alan Maki	Mr. Owen McHugh	Mr. Greg Milne
Mr. Jon Moore	Dr. Edward Owens	Dr. Walter Pearson
Dr. Jack Ruitenbeek	Dr. Malcolm Stephenson	Mr. John Thompson
Mr. Chris Wooley		

Examination by Ms. Karen Campbell for the Coalition (continued) 5983

Examination by Mr. Neil Patterson of the National Energy Board 6793

Examination by Mr. Dave Shannon of Douglas Channel Watch 6824

Examination by Ms. Cheryl Brown of Douglas Channel Watch 7028

**Examination by Ms. Karen Campbell for the Coalition (continued) 5983**  
(ForestEthics Advocacy, Living Oceans Society, Raincoast Conservation Foundation.)

### **On insurance amounts for clean-up costs**

Ms. Campbell asked for clarification around oil spill response funds, asking if the international conventions and insurance funds amount to approximately \$1.3 billion for compensation, clean-up and natural resources damages. Mr. Carruthers answered that the federal and international funds total the mentioned amount. Dr. Ruitenbeek added that the funds in question are available for any type of ship-based oil spill.

Ms. Campbell asked if it were true that the clean-up costs for the Exxon Valdez spill were “well in excess” of \$1.3 billion. Dr. Ruitenbeek answered that it was true, but noted that the clean up took place in different jurisdictions than those of the current proposal. 6002

Ms. Campbell asked if NGP would assume liability for any clean-up, compensation and remediation costs exceeding the \$1.3 billion limit. Mr. Carruthers spoke about the various spill response programs for the project area, indicating that British Columbia uses the polluter pays principle, which deems tanker owners as responsible for spills. He stated that NGP would take responsibility for its pipeline and terminal, but that tanker spills are the responsibility of tanker owners. 6006

Discussion continued around responsibility for clean up costs beyond the \$1.3 billion mark. Mr. Carruthers noted that available insurance funds “have never even come close to being used” in Canada. Dr. Ruitenbeek added comments about the availability of provisions for policy-makers to increase levies for spill funds. Dr. Owens added comments about prevention advances and spill reductions since the Valdez spill. 6014-6034

### **The safety of double-hulled tankers**

Picking up on Dr. Owens’ comments about the use of double-hulled tankers, Ms. Campbell noted NGP’s statement from [Exhibit B3-42](#), page 1, “*beyond the preventative measures, there is the potential for tanker grounding [and] collision.*” Mr. McHugh agreed that double-hulled tankers are not immune to spills, but noted that “a lot more energy” is needed to pierce through both hulls. He referred the question to the Shipping and Navigation Panel. 6035-6041

Ms. Campbell highlighted [Living Oceans Society’s evidence](#) on page 17, showing various examples of ruptures to double-hulled tankers. She asked for agreement that “*it’s prudent and precautionary to plan for an anticipate groundings and collisions*”. Mr. McHugh agreed that double-hulled tankers are not fail-safe, but that they offer the best option for limiting spill sizes. Further questions on the matter were deferred to the Shipping and Navigation panel. 6042-6055

### **Behaviour of spilled dilbit and condensate**

Mr. Belore confirmed for Ms. Campbell that when dilbit spills, its lighter fractions will begin to evaporate, which he pointed out is the case for any oil. Ms. Campbell asked if dilbit is composed of 10-30 percent condensate. Mr. Belore answered that the amount of diluent in a product depends on tariff specifications, which will vary depending on season and the type of bitumen being diluted. 6057

Further discussion on the matter continued, with Mr. Belore explaining the difficulty of distinguishing components of an oil product once spilled, and Ms. Campbell seeking to understand the flammability of spilled dilbit, and the subsequent risk of explosion. Mr. Belore agreed that a fire concern exists for large condensate spills. 6067

Ms. Campbell proceeded with questions related to health concerns of evaporated condensate, once spilled. [Exhibit B3-22](#), page 120 was called up by Mr. McHugh to illustrate a spill example and the resulting quick evaporation and dispersion of spilled condensate. 6089

Discussion continued around the issue of flammability of spilled products. 6125

Ms. Campbell asked for agreement that condensate is toxic to aquatic organisms and has the potential to cause long-term adverse effects. Dr. Stephenson spoke about the difference between long-term effects and acute effects, agreeing that condensate could cause acute effects, but pointed out that exposure would persist for up to do two days only, which would be unlikely to cause long-term chronic effects. 6162

Calling up [NGP's Fate Modelling Report](#), Ms. Campbell asked about the modelling of two diluted bitumen products, asking why only one product was included in the final detailed assessment. Mr. Belore explained that the two products being evaluated were found to be similar in terms of viscosity, density and other properties. As such, NGP chose to model the behaviour of only one of the products when spilled. Mr. Belore continued with a detailed explanation of the methods used and findings of the modelled spill behaviour of the product. 6180

Discussion continued around the likelihood for oil products to form stable emulsions in water, and the methods used to understand the issue. Another report on the subject, [Exhibit B193](#), was called up. Please see transcript for detail. 6207

Ms. Campbell asked about asphaltene. Mr. Belore explained that it is a component of all crude oils and couldn't answer whether or not its density is heavier than water. Ms. Campbell continued with questions on the properties of asphaltene, and Mr. Belore was unable to answer them. Dr. Stephenson called up [Exhibit B9-24](#), Adobe 9, which gives limited information about asphaltene content in MacKay River diluted bitumen. Discussion continued around the weight percentages of various products in relation to asphaltene content. 6279

Ms. Campbell asked further questions about the findings on evaporation rates and density of the MacKay River product, as referred to in NGP's modelling of the product on pages 73-74 of [Exhibit B16-31](#). Mr. Belore provided details of the processes involved in evaporation and density changes. Please see transcript for greater detail. 6329

### **Sediment interaction with spilled product**

Ms. Campbell asked if NGP had filed evidence in regards to the reaction of dilbit or synbit spills with suspended sediments. Mr. McHugh confirmed that it had, pointing to

[Exhibit B164-13](#), page 57. Ms. Campbell asked if measurements had been taken on the quantity and particle size distribution of sediment suspended in Kitimat Arm, Douglas Channel, Wright Sound or Hecate Strait. Mr. McHugh indicated that some measurements for Kitimat Arm had been included in the Marine Physical Environment Technical Data Report. 6359

Mr. Green confirmed that the previously mentioned study was not done to analyze a bitumen spill and its interaction with sediment in a marine environment, but rather to collect baseline information on sediment. He agreed to look for similar information for other marine areas of the project. 6377

Ms. Campbell asked for confirmation that no real-world examples exist of spilled bitumen or synthetic crude in a marine environment, as stated by Environment Canada (EC) in [Exhibit E9-6-32](#), page 20. The witnesses indicated that the Trans Mountain spill in the Burrard Harbour in 2006 was synbit, but that it was possible EC didn't consider it a marine spill because it wasn't directly spilled into the marine environment, but rather travelled to it. 6391

Referring to page 20 of the same exhibit, Ms. Campbell asked if the witnesses were aware that EC had found NGP's fate modelling study to be inadequate, citing concerns around the failure to model sinking oil and interaction with sediment. Mr. McHugh spoke about the potential for improvements, and described the purpose of the models. Discussion continued around the likelihood for lighter oil to sink and disperse in water. 6398

### **Weathering and viscosity of spilled product**

Ms. Campbell asked about NGP's tank test from [Exhibit B193](#). Mr. Belore provided details on the purpose and methodology of the test, and how it related to real-world conditions. Ms. Campbell continued with questions about the veritability of the test conditions and applicability to real-world conditions such as UV exposure, water temperature, current velocity and wind speed. Discussion continued around the results of the study, and the findings around the oil's tendency to submerge, in particular. 6410

Ms. Campbell asked for confirmation that NGP's tank study was not submitted as evidence that a dilbit spill leaving Kitimat would not result in submerged or sunken product. Mr. McHugh responded that the intent of the study was "to look at what the oil looks like from a physical weathering process." The witnesses continued to provide explanations of the findings of the study, focusing on the tendency for the oil to stay on the water's surface. 6485-6496

Mr. Belore confirmed that weathered oil on the water's surface will be "very viscous". Ms. Campbell asked if such oil will stick together to form blobs. Mr. Belore said that the products in question will emulsify and form blobs the same way as heavy fuel oils, which spill responders are used to dealing with. He called up [Exhibit B16-31](#), page 34, which shows test results on the subject. Discussion continued. 6497

Dr. Owens stated that recovery of highly viscous oils has been taking place since the 1970s, and that new pumps and other equipment have been developed to recover such products. Discussion around recovery of high viscous oils continued. Please see transcript for greater detail. 6515

### **Dispersant use and spill clean-up measures**

Discussion continued around NGP's tests of some of the proposed products to be shipped, including the use of dispersants and their impact on the formation of emulsions. [Exhibit B46-40](#) was called up and discussed. 6535

Ms. Campbell asked if NGP's evidence indicated that the use of dispersants would not be possible 12 hours after a spill in winter conditions. Mr. Before answered that the modelling doesn't necessarily indicate that. He explained that if a spill were ongoing for longer than 12 hours, fresh oil could still be amendable to dispersants, depending on whether emulsions form. He concluded, "the potential to use dispersants is a... complex process that will have to be worked out at the time of a given spill", acknowledging that the formation of emulsions will likely deem the dispersants ineffective. Discussion on the matter continued. 6566-6598

Dr. Owens noted that NGP's tank tests were done in part to understand the limits to the use of dispersants, pointing out that dispersants offer only one of a range of available tools. He stated, "*it's really important to recognize that we are not dependant on one tool or one strategy... You can actually have dispersant application going in one area and burning in another and mechanical recovery in another area.*" 6600-6602

### **Limitations to recovery efforts**

Ms. Campbell proceeded with questions related to the effects of wind, wave and current conditions on the use of dispersants and other recovery methods, calling up [Exhibit B21-2](#). Dr. Owens and Mr. McHugh agreed that the evidence indicates a one-meter wave height limit for mechanical recovery and in-situ burning method for spilled oil, and a three-meter sea height limit for the use of dispersants. 6606

Ms. Campbell called up [Exhibit B17-18](#), page 20 and Mr. McHugh confirmed that the evidence shows that a one-meter sea height would be exceeded in the South Hecate Strait approximately 70 percent of the time, though added discussion about recent technology increasing the recoverable sea height limit to between two to three meters for mechanical recovery. Discussion on the various parameters involved in recovery limits, continued at length. 6660

### **NGP's 10,000-meter spill models**

Ms. Campbell asked if NGP's 10,000 meter modelling of four spills in the CCAA and OWA included any ecological or human health risk assessments. Mr. McHugh answered that no such assessments were completed for those models. Mr. Green stated that wildlife mortality estimates were not provided for the models. Similar discussion ensued in regards to addressing losses to commercial fisheries, cultural or traditional practices, and clean-up costs in NGP's models. The witnesses pointed out that such aspects were addressed in other areas of NGP's evidence. 6712

Discussion turned to whether or not it is possible to properly assess the impacts of a spill on First Nations without baseline information on traditional uses. Mr. Green pointed out that NGP is committed to conducting a three-year harvesting study for each of the coastal Aboriginal groups. 6732

Ms. Campbell asked at what point emergency response would be mobilized to help a tanker in distress and Mr. McHugh answered that response would take place “*as soon as notification occurred, which would be very prompt.*” He spoke about the use of escort tugs as initial response mechanisms. 6746

### **Wildlife recovery in the event of a spill**

Ms. Campbell asked how oiled wildlife would be responded to in the event of a spill. Mr. Milne answered that “robust emergency response planning” would be implemented, which would include arrangements with wildlife first response organizations. 6752

Pulling up Exhibit [D122-7-10](#), page 10, Ms. Campbell pointed out that in BC, there are less than 15 trained individuals to deal with wildlife in the event of a spill. She asked how NGP would address this shortage. Mr. Milne answered that wildlife response organizations use experts across various regions and are able to deploy people “quite rapidly.” Mr. McHugh pointed out that NGP identified existing wildlife management response companies in BC in [Exhibit B41-15](#). 6758

### **NGP’s commitments over and above regulatory requirements**

Ms. Campbell noted NGP’s numerous marine safety and spill response commitments that exceed regulatory requirements. She asked how assurance could be given that any future owner of the pipeline would adhere to such commitments. Mr. Carruthers answered that he anticipates the approval of the project will be subject to certain conditions. Discussion continued as to whether or not all NGP’s commitments would be incorporated into the certificates granted to the project. 6767

Following the break, Mr. Green provided information related to Ms. Campbell’s earlier questions around spatial distribution of suspended solids and shipping and navigational issues. See transcript for detail. 6784

### **Examination by Mr. Neil Patterson of the National Energy Board 6793**

Referring to the discussion at line 3771, Mr. Patterson asked Mr. Moore about his experience with the four to five heavy fuel oil spills, asking what type of oils they involved, and what the specific gravity of the fuels is. Mr. Moore answered that he couldn’t give more detail other than knowing that the spills involved heavy fuel oils. He committed to undertaking to find the specific type and specific gravity of the fuel.

### **Examination by Mr. Dave Shannon of Douglas Channel Watch 6824**



### **Reliability of data from weather stations along the coast**

Mr. Shannon asked about the format for the latitude and longitude measurements in NGP's Hayco technical data reports, [Exhibit B17-19](#), and [Exhibit B17-22](#). Discussion continued as to how close the given weather stations are to land masses and other physical features. Mr. Shannon then called up [Exhibit B17-21](#), Adobe 17, and asked about wind vector and flow measurements in the document. Discussion on the topic continued.

Mr. Shannon continued with questions related to NGP's installation of weather stations in the project area. Mr. Green pointed to [Exhibit B17-19](#), page 12, to indicate NGP's stations, as well as Environment Canada's stations. Discussion on weather conditions in the area continued. 6875

Mr. Shannon asked how appropriate clearance from obstructions is determined for the positioning of environmental monitoring stations. Mr. Green answered that there is no regulation on the matter, acknowledging that in some cases, stations have to be installed in areas where significant cover exists nearby, which will influence wind measurements. He pointed out that a network of stations help to predict wind, not just individual stations. 6888

Mr. Shannon continued with questions about wind measurements at the GEM station at Wright Sound, again asking how wind direction and speed can be accurately measured when the stations are sheltered. Mr. Green responded, "*very few stations are able to measure wind direction effectively in all directions and so each station, of you read in the text of this report, describes what it's good for in terms of which directions is it most effective in measuring wind data and also which directions it is least suited to measure.*" 6894-6899

Similar discussion continued. Mr. Green explained why the locations of the stations were chosen, pointing out that NGP's six stations are maintained by Haisla Nation members who access the stations by boat. Mr. Shannon asked if NGP's meteorological data collection had ever been validated. Mr. Green spoke about NGP's stations being "a step well beyond what anyone else in this region has done." Similar discussion continued. 6902

Mr. Shannon continued with questions around the wind vector measurements for Wall Island station, as reflected in [Exhibit B17-21](#), Adobe 39. 6914

### **The role of salinity content in water**

Mr. Shannon called up [Exhibit B16-31](#), page 43, which depicts density changes of Mackay dilbit spilled at the terminal during summer conditions. He proceeded to call up other exhibits presenting further information and asked about density changes under various circumstances, and whether submergence of oil could be expected. Mr. McHugh explained that a combination of various factors will determine the trajectory of spilled oil, and that the spill models are simplistic, and are only meant for demonstrating "what the parameters look like." 6947

The witnesses continued to discuss other factors that would influence the trajectory of spilled water such as salinity content in water, and its effect on the density changes of spilled oil. Dr. Owens explained that freshwater flowing out of a river and into the ocean will act as a barrier to spilled oil and essentially protect wetlands and marshes. 6987

### **The challenge of bringing in spill response experts during extreme weather events**

Noting Mr. Milne's previous comments about the ability for oil spill response experts to arrive at a scene on short notice following a spill, Mr. Shannon stated that often times weather conditions in the area prevent travel for days on end. He asked how spill response experts would cope with such barriers when trying to arrive within the 6-12 hour spill response window. 7006

Mr. Milne explained that NGP would have trained responders in Kitimat, and that he expected other local communities would have people who could respond to a spill. He added, "we...feel very confident that we would be able to move people in—where required, in an expedient and safe manner". Discussion on the matter continued. 7009

### **Examination by Ms. Cheryl Brown of Douglas Channel Watch 7028**

#### **Adequacy and Accuracy of NGP's models**

Ms. Brown asked for agreement that in many of NGP's modelling of currents, wind, salinity and other factors, it was indicated that "*more studies were required and the data [NGP] was working with was at times marginal and other times questionable.*" Mr. McHugh answered that he felt NGP had done the best job it could with the available data, noting that commitments had been made for improvements through the proposed scientific advisory committee. 7030

Ms. Brown noted various instances where NGP indicated difficulty in taking measurements, such as on page 42 of [Exhibit B25-02](#), where the difficulty of determining the salinity level in the water at Kitimat Arm was stated. She asked for agreement that further studies are needed in the area. Mr. McHugh answered that it comes down to asking "*what is this model being used for?... And how specific do you need it to be?*" He spoke about NGP comparing its data to other sources for validation. 7037

Ms. Brown continued with questions about validity and accuracy of NGP's data and modelling results. Similar discussion ensued, with the witnesses emphasizing that consideration needs to be given to what the models are being used for, and pointing out that in the case of a spill, real-time observations would complement the models. 7075

Ms. Brown asked what studies the witnesses anticipated would be pursued to enhance NGP's models. Mr. McHugh answered that it would be useful to compare actual meteorological data with what had been predicted by NGP's models. He added that looking at the interaction of sediment concentrations in the models had been talked about. Similar discussion ensued. 7107

Ms. Brown turned to NGP's tank experiments with Cold Lake Bitumen and asked how such research would apply to the conditions in Kitimat Arm. Mr. Belore answered that



the purpose of the experiments was to understand how the product would weather and if it would sink, not to simulate all the processes in the real world. He added, “*the only way to emulate what’s happening in Kitimat Arm is to spill oil there. And we have no intention of doing that.*” 7130-7140

### **Recovery of biodiversity following a spill**

Ms. Brown asked about NGP’s comments on forest re-growth and recovery times from [Exhibit B83-17](#), page 6, inquiring if biodiversity was taken into consideration in such a context. Dr. Pearson and Dr. Maki answered that in their studies, Valued Ecosystem Components are focused on, rather than ecosystem functions or biodiversity. Discussion on the subject continued, with examples of rapid recovery following the Exxon Valdez spill given by the witnesses. 7142

Ms. Brown noted three definitions of recovery given on page 4 of the exhibit and asked which one NGP relied upon. Dr. Pearson explained that NGP’s monitoring program would use a *before-after control impact design*, which examines whether impacts to a population occur following an impact on an area, by surveying control and impact areas. He explained that NGP’s approach to recovery is looking at a return to conditions that would have prevailed if a spill hadn’t occurred. 7208

### **Oil deposition and sediment**

Ms. Brown proceeded with questions about soft sediment marshes and the interaction of spilled oil in sub-tidal sediments, pointing to [Exhibit B3-22](#), page 128. Dr. Stephenson explained, “*the effects of hydrocarbon contaminants on subtidal sediments are negligible.*” Discussion on the interaction of spilled oil and sediment continued. Please see transcript for detail. 7221

Ms. Brown asked if NGP planned to do further studies on the sedimentation occurring in Kitimat Arm. Mr. Green replied that such studies were not planned, though noted that the planned Marine Environmental Effects Monitoring Program would include measurements of water, sediment and biota. Discussion continued, and Mr. McHugh pointed out that on page 57 of [Exhibit B164-13](#), NGP states that further examination into the interactions of suspended particulate matter could be a part of the work of the Scientific Advisory Committee. 7312

Ms. Brown again asked about NGP’s understanding of sediment loads specifically in the Kitimat Arm and the witnesses stated that they believe the area has a low sediment load and that NGP disagrees with Environment Canada’s findings that the suspended particulate matter in the area would play a predominant role in the transport and fate of spilled oil. 7335

Ms. Brown called up [Exhibit B3-22](#), and asked if it were true that it shows a high risk of spill at the marine berth. Mr. McHugh answered that he wouldn’t agree there is a high risk of spill in the area. He proceeded to explain the purpose of risk assessments and the calculation of spill scenarios. Mr. Langen pointed out that the line of questioning would be more appropriately put to the Shipping and Navigation Panel. 7356

Ms. Brown asked further questions about the terminal loading parameters and was again encouraged to pose such questions to the subsequent panel. Mr. McHugh also provided general details about NGP's commitments for response equipment at the terminal. He provided further details in response to Ms. Brown's questions about the modelled 250 cubic meter condensate spill at the Kitimat terminal in the same exhibit. 7380

Dr. Stephenson explained that PAH levels are similar for various hydrocarbons, as indicated in [Exhibit B80-2](#), page 65. Ms. Brown asked if PAHs are the most persistent in the environment and Dr. Stephenson answered that various components within hydrocarbons are responsible for different aspects of toxicity, stating "*acute toxicity is more attributable to what we could call the "mono aromatics", things like benzene, toluene, ethyl benzene, the light ends, which are more soluble in water. But, certainly, in terms of more persistent components of the hydrocarbon that have been implicated in toxicity, the PAHs would be among them; that's correct.*" 7409-7431

### **Condensate spills**

Mr. Belore answered questions about dispersion rates for condensate in water, and how the material interacts with sediments. Dr. Stephenson pulled up [Exhibit B16-33](#), page 2-32, to illustrate the process being discussed. Discussion turned to the expected dispersion process in the event of a condensate spill using the spill example from [Exhibit B25-5](#). 7433

Ms. Brown asked how response to a condensate spill is approached. Mr. Milne explained that all staff at the terminal would be trained to follow certain response procedures, which would almost always begin with ensuring their own personal safety and that of those around them. He noted that responders would carry gas monitors when approaching a spill area, and would not access an area that is hazardous or flammable. Discussion continued around what can be done in the first 30 minutes following a spill, and what the human health risks of being exposed to spilled condensate are. 7474