Alan Ehrlich

From: Keith Rosindell [rosindell1@calgary.westerngeco.slb.com]
Sent: Monday, December 23, 2002 9:47 AM
To: O.D. Hansen; Johannesen, Daryl; Dean Kennedy; Maurice G. G. Steel (Maurice G. Steel); John Korec; Laura Van Ham; Jonathan Allen; Kevin Bill; Pete Cott; Bruce Hanna; Sarah Crabbe; Gavin More; David Hannay; Derek Melton; Stephen Dix Whidden; Eric Gyselman; Robert Kieser
Cc: 'Melanie Van Gerwen-Toyne'; Alan Ehrlich; 'Andy Graw'; 'Elaine Blais'; 'Jody Snortland'; 'Judy Sabournin'; 'Katherine Thiesenhausen'; 'Vanessa Charlwood'
Subject: Minutes from Dec 5th workshop.

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Enclosed please find copied the minutes of the WesternGeco, 5th December Acoustic, Fish and Wildlife Report "roll-out".

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WesternGeco Meeting Minutes – December 5, 2002

Technical Workshop for WesternGeco 2002 Field Studies
Location: Westin Hotel, Calgary, Alberta
Attendance: 23 people (attendee's list attached)
Purpose: To present and discuss 2002 studies on acoustics, effects of airguns on fish and wildlife monitoring. WesternGeco staff, regulators and consultants were in attendance.

Agenda Schedule	Comments/Questions Raised	Response
Introduction	Keith Rosindell from WesternGeco introduced the meeting and gave a safety briefing. Daryl Johannesen from Golder Associates Ltd. was introduced as chair, and stated the two goals of the meeting (as follows): 1. WesternGeco is presenting the acoustic and fish studies, plus wildlife monitoring. 2. There is an opportunity for an open discussion relating to the studies and how they fulfil the objective to support EIA process.	
Welcome	Steve Whidden from WesternGeco welcomed everyone to the meeting and thanked them for their participation.	
	Daryl Johannesen introduced the study team (slide).	
Project Presentation	Dean Kennedy from WesternGeco presented an overview of the 2002 studies and the proposed 2003 project. He discussed the project history, the 2002 research area, the seismic equipment, and the vessels involved. He stated that the 2003 program potential is 2000 km and the total acquisition time is between 60-75 days. The test programs in 2002 were carried out safely, with we believe no damage to the environment. Expenditures have now exceeded $10 million (an amount far greater than expected), however, the company is committed to continuing the project to completion.	
Break	Round table introduction of all attendees, followed by a 15-minute break. The agenda was then altered so that DFO conference call attendees could be connected later for acoustics	

	presentation.	
Wildlife Presentation	Derek Melton from Golder Associates Ltd. presented the 'Wildlife Monitoring Survey for the WesternGeco Mackenzie River Seismic Test Study'. Refer to the draft report for detailed information.	
	John Korec – Where do you expect to see beaver?	Derek Melton - This is low quality habitat. If you are going to see them on the Mackenzie, it's probably more when they are dispersing between areas and using the river. They'd be along the shore, and probably at the mouths of tributaries. We understand this from literature and from community consultation.
Break	Handouts of wildlife talk provided before 15-minute break	
Acoustic Presentation	Dave Hannay from Jasco Research Ltd. presented the 'Acoustic Measurements of WesternGeco Airgun Noise in the Mackenzie River' study. Refer to the draft report for detailed information. A talk hand-out was also distributed.	
	Robert Keiser – Can you explain graphs 11A and 14A, sound level versus range? The sound level at the 1m depth is much lower then at the 2m depth. Is this to be expected?	Dave Hannay – These results are from different locations. I think you have to compare levels at one site, not between sites because there are other factors involved.
	Keith Rosindell – There is a noticeable difference between sound levels at 1 m and 5 m in graph 11A. Why?	Dave Hannay – This is due to modal propagation. With modes, the pressure goes to zero at the surface, and that's a consequence of the shallow water propagation.
	Robert Keiser – The fact that it cuts off at 1m, is that reasonable with what you understand about the acoustics?	Dave Hannay – Yes. If you were to lower a hydrophone from the surface slowly down, you would be able to map out an increase from 0 at the surface to a maximum somewhere in the 2-5m range.

	Robert Keiser – Would you expect a much-reduced sound level near the bottom?	Dane Hannay – It depends on the consistency of the substrate. Here we have sand. The broad band energy levels will be zero or very low levels right at the surface, increasing fairly rapidly, and then staying fairly consistent as you move towards the bottom.
	Robert Keiser – Your goal was to measure the sound levels in the horizontal plane as you go out from the array. What would be the maximum sound levels under the array?	Dave Hannay – We made measurements of sound levels between the air gun arrays, which would correspond with the levels directly beneath. They were similar to the measurements we made at the 2m range. From a theoretical standpoint, we would expect to have a 6 db increase over the broadside horizontal measurements directly beneath. However, you will not physically see this because the distance that you have to get to achieve this far field result is actually under the riverbed. And when this occurs, you'll observe levels that are similar or the same as the broadside measurements.
	A discussion regarding the fish cage measurements at 2m took place. There may have been a typo. Dave Hannay stated that he'd have to refer back to the report to confirm the results, but they have a real measurement at 2m, so it should be correct.	
	Relating back to Robert Keiser's question, Keith Rosindell stated that if there is a variation in the bottom substrate (i.e. rocks) there is a possibility that you'd see higher amplitude at depth.	
	Dave Hannay stated that if you have a perfect acoustic reflector at the bottom, the levels are typically twice as high as they would be at the midway column.	

	Pete Cott – All of the measurements recorded were with a 1500in^3 array gun. Did you find different results when using a smaller size gun (i.e. 1000 and 1250 in^3)?	Dave Hannay – We didn't specifically monitor those sizes of air guns. (However, Steve Whidden later showed seismic results that were taken with a range of gun sizes, and the smaller guns didn't show distinctive layer results or give as good a data set. He stated that these results wouldn't fulfill seismic or clients' needs, so 1500 in^3 array likely smallest to meet needs).
	Keith Rosindell stated that the co-efficients don't change with volume.	
	Pete Cott - Perhaps a 1000in^3 array gun would have less environmental impact then a 1500in^3 array gun?	Keith Rosindell stated that the object of the study was to give the worst case scenario, and they would not be using an array gun larger then 1500 in^3.
	Robert Keiser – Are you planning to publish the results?	Dave Hannay – Yes, due to the uniqueness of the study and the lack of data in other literature.
	Steve Whidden stated that the concern was to get the survey completed first, and then publish. The study was completed in the interest of demonstrating that the impact to the environment of their seismic survey was minimal, not so much for scientific research. A long-term goal however, would be to publish the results.	
Lunch	1 hour lunch break	
Fish Study Presentation	Sarah Crabbe from Golder Associates Ltd. presented the 'Behavioral and Physical Response of Riverine Fish to Airguns' study. Refer to the draft report for detailed information. A talk hand-out was also provided.	
	Keith Rosindell – Can you give us an idea of the distance and diameter that you could sample for fish with hydro-acoustic equipment?	Sarah Crabbe – We were able to get data 100 m back with a diameter of about 5 m.
	Eric Geiselman – How did you decide that two pings were the same fish and how did you decide on movement vectors?	John Kelso – You could actually follow the individual fish because they were moving slowly.
	Eric Geiselman -Did you use target strength at all to classify the fish as to	John Kelso - Yes we did.

	whether two successful pings were the same fish?	
	Steve Whidden - Can an assumption be made that there are the same numbers of fish behind the operation as there are in front? (Did we chase the fish out of the area?)	John Kelso – The abundance and distribution of fish at any location at any time is quite variable. If there was an influence of the air guns, you'd expect that variability to change in a certain way. We found that both the distribution and abundance were variable, but it remained so that a peak or particular distribution could occur at any time. The data showed that it didn't seem to matter whether the air gun system was operating or not.
	Bill Griffiths – When you were doing the vertical and horizontal test, how far were the fish away from the array, and how much sound were they getting?	John Kelso – The fish were less then 10m away.
	Bill Griffiths – Are the fish exposed to over 200 dbs?	John Kelso – Yes. But keep in mind that we were aimed pointing downstream so the fish that were targets were drifting that way. The fish were very close to the air guns, and only one fish clearly changed its path away from the air gun. However, the sample size was relatively small (36) and the species was unknown.
	Pete Cott – Could you tell the speed that the fish were moving relative to the current?	John Kelso – Yes, we could, but we didn't. The trajectory of all fish was not straight down the stream, but we were looking for a change in that direction.
	Pete Cott – There were fish that were pointing and moving in different directions?	John Kelso – Yes.
	Eric Geiselman stated that it might be useful to show in the report (with a description or a figure) that the vector is relative to the current so we can see where the fish are moving in time.	John Kelso – In a sense we do look at those vectors. We set some general classes where we sort the movement of fish. However, that could go farther. We went through all of the steps, but we didn't include that in the report. We could back up and provide those

		results; however, the outcome won't change.
	Sarah Crabbe stated that they had some fish at the closest exposure that were momentarily stunned, but by the time they were in the holding tank, they were back to normal.	
	Steve Whidden – Were they all stunned?	Sarah Crabbe – No, only a small proportion.
	Pete Cott – Were they all the same species that were stunned?	Sarah Crabbe – In the first test, yes it was all one species. We didn't note the species in the second test.
	John Korec – Can you extrapolate the stunned results to larger fish? Why weren't large fish closer to the array?	Sarah Crabbe – The larger fish were in the cage located 8 m from the array. John Kelso – We followed a standard toxicity test procedure.
	Steve Whidden – We had some resistance from the community about handling and using large fish. We limited the work we were doing to mostly small fish and only a few large fish to appease the community.	
	Pete Cott stated that the DFO never said not to use big fish; they just said that using small fish would be ok.	
	John Kelso stated that it was also hard to catch large fish and that they needed a reasonable amount of animals to expose at each level for the experiment.	
	Eric Geiselman – From the study, what was the physiological effect on the fish?	John Kelso – Some of the fish were sent for pathological testing, and nothing clear was found. That wasn't surprising because the effect was not lasting.
	Bill Griffiths – What is the definition of stunned?	Sarah Crabbe – When we pulled the cage out, we observed immobile fish.
	John Kelso stated that an anecdotal observation was made that some fish were stunned, and no mortalities occurred.	
	Sarah Crabbe stated that it took 5 minutes or less for the stunned fish to become active again.	
	John Kelso stated that the fish at closer	

	exposure (2 m) were somehow affected.	
	Keith Rosindell stated that sometimes the cage drifted closer than 2 m to the array, and that some of the affects of the fish could be due to pressure from the gun.	
	Steve Whidden stated that this test was a worst case scenario and that in reality, the fish would never have this sort of exposure.	
	Bill Griffiths – Were the 4 mortalities found at the same exposure sites?	Sarah Crabbe – There were a couple mortalities from 85 m and a couple from 450 m.
	Bill Griffiths – How did 17 fish escape?	Sarah Crabbe – Some fish escaped when we were checking the cages for mortalities.
	Chris Always – Were the cages lined up in a line or off to the side?	Sarah Crabbe – They were at an angle away from the array. The set up was not so important as the exposure level.
	Daryl Johannesen stated that the original concept was to create a model of fish effects related to sound levels.	
	John Korec – In future, would you perform the experiment the same way?	John Kelso – Yes.
	Dave Hannay stated that the experiment design was excellent. He was not used to having a marine seismic operation allow for such manipulation to facilitate monitoring.	
	Bill Griffiths – Were you surprised at the lack of damage to the fish?	John Kelso – Yes, I was initially surprised. However, on reflection I realised there was nothing in the literature to suggest that we should've expected mortalities.
	There was a lengthy discussion between Eric Geiselman and John Kelso relating to the data collection process and the conclusions drawn from the results. Eric argued that the conclusions were bold based on results, and John acknowledged the limitations of the gear, but argued that the study gave the best results for studying the distribution of large fish.	
	Derek Melton stated that WesternGeco	

	wanted to alleviate concerns regarding impacts to fish, and the company wants to move forward with its program, so one option may be to monitor fish affects during work next year if a permit is granted.	
	Steve Whidden stated that the company was interested in alleviating concerns, not to answer all the questions. He stated that the seismic program is a 'no footprint' technique.	
	Laura Van Ham – Are there any outstanding questions that prevent us from making conclusions?	Pete Cott – Yes, there are outstanding issues, but the study definitely does alleviate concerns. At this point we need to have further discussions with WesternGeco, and as Derek Mentioned, it may be possible that some outstanding concerns could be dealt with when production is underway.
	Bill Griffiths – Why weren't corigonids used?	John Kelso – They were too small and we would have been impacting them just with handling procedures.
	Daryl Johannesen stated that it was clear, through community consultation, that the First Nations groups didn't want game species used in any studies.	
	Pete Cott stated that the capture of corigonids was permitted, but it wasn't performed and also that the DFO wanted the oval beam transducer to be used.	
	Eric Geiselman – Is it possible that a corigonid study could be done in a university quickly?	Keith Rosindell – No. The results are too costly and timely to produce.
	Daryl Johannesen stated that different options were looked at, but bio-sonic equipment was chosen based on what was available, and the condition and size of the river.	
	Keith Rosindell thanked everyone for a good discussion and stated that Eric Geiselman's concerns would be addressed by the final report.	
Break	15-minute break	
Community Monitor Presentation	O.D. Hansen from WesternGeco presented the community-based	

	monitoring overview. He stated that members of the community were hired to report any changes or differences resulting from the studies. There were no visible changes reported during or after the program as compared to before, and it was found that the community members talked to were not opposed to the seismic operation.	
	Bill Griffiths – Was there anyone fishing at the time these operations were carried out?	O.D. Hansen – Yes.
	Keith Rosindell – There were no complaints from shore-based monitors. Did the DFO hear anything?	Pete Cott – No, not really.
	Keith Rosindell – Sarah, could you expand on the dead fish?	Sarah Crabbe – It was obvious that the fish had been washing on the shore for awhile and it was obviously an older fish and didn't raise any concerns.
	Bill Griffiths – Were people from Deh Cho involved?	O.D. Hansen – Yes, they were involved as monitors.
	Daryl Johannesen stated that the rationale for using community monitors was to alleviate concerns that fish weren't found dead once the boats had left the area. The monitors covered off the spatial difference once the boats had passed.	Derek clarified that Deh Cho monitors were part of the on vessel wildlife monitoring team.
Open Discussion	Pete Cott – When are you applying for next season?	Derek Melton – WesternGeco is currently preparing two EIA submissions (Delta Project and Valley Project). The drafts terms of reference for the Valley EIA should be out before Christmas. Submissions planned for January 2003.
	Pete Cott – So you would like to start the actual program in 2003 fairly soon after the ice is gone?	Steve Whidden – Yes, we would probably like to start in late June. However, we are spending money on mobilization without permits.
	Pete Cott – Will you identify the drop dead date?	Dean Kennedy – Yes. Keith Rosindell – We are hoping to have some decisions by about April 10th.
	Keith Rosindell stated that the Yellowknife technical meeting on the 2002 studies is scheduled for December 12th.	

	Bill Griffiths – Who is the target audience?	Keith Rosindell – Regulators and renewable resource persons interested in the studies.
	Derek Melton stated that the draft study reports are available to the public. However, more appropriate materials will be taken to community consultations in the New Year. Also the final study reports will be included in full as appendices to the two EIAs.	
	Keith Rosindell stated that outstanding concerns will be addressed in the final reports and that he hopes some questions were also answered here today.	
Meeting Conclusion	Steve Whidden thanked everyone for attending and the meeting was concluded.	

Attendee's List

Name	Organization	Contact
O.D Hansen	WesternGeco	(403) 509-4169
Daryl Johannesen	Golder Associates Ltd.	(403) 299-5613
Keith Rosindell	WesternGeco	(403) 509-4660
Dean Kennedy	WesternGeco	(709) 687-4304
Maurice Steel	WesternGeco	(713) 253-9494
John Korec	National Energy Board	(403) 292-6614
Laura Van Ham	National Energy Board	(403) 299-2769
Bill Griffiths	LGL Ltd. – Sidney, BC	(250) 653-0127
Jonathan W. Allen	EIRB – Inuvialuit Settlement Region	(867) 777-2828
Christopher Alway	Joint Secretariat – Comm. Support	(867) 777-2828
Kevin Bill	FJMC – Inuvialuit Settlement Region	(867) 777-2828

Pete Cott	DFO	(867) 777-7520
Bruce Hanna	DFO	(867) 669-4931
Sarah Crabbe	Golder Associates Ltd.	(403) 260-2241
Serge Metikosh	Golder Associates Ltd.	(403) 216-8959
John Kelso	Golder Associates Ltd.	(250) 498-0795
Gavin More	GNWT – RWED	(867) 920-6392
David Hannay	Jasco Research Ltd. Victoria, BC	(250) 483-3300
Lisa Ruddell	Golder Associates Ltd.	(403) 216-8958
Derek Melton	Golder Associates Ltd.	(403) 299-5659
Steve Whidden	WesternGeco	(403) 509-4498
Eric Geiselman	DFO – Winnipeg	
Robert Keiser	DFO – Pacific Biological Research Center, Nanaimo, BC	(250) 756-7181