TRANSBOUNDARY GAS GROUP

STEERING COMMITTEE MEETING NOTES

September 30, 1999
Nelson, British Columbia

I. Greetings and Introductions.

Julia Beatty welcomed everyone to the meeting, held September 30, 1999 at the Prestige Lakeside Resort in Nelson, B.C. She introduced Bev Raymond and Mark Schneider, co-chairs of the Transboundary Gas Group, as well as Cathy Scott-May, the facilitator for today's meeting.

Schneider said it is his goal to come out of today's meeting with a tangible work product. If that doesn't happen – if we can't go back to our employers with something in hand that says here's what the TGG has done and where it's going – some of us may disappear from this effort, he said.

The hard work I'm expecting is that each of the subgroups will give us a report on what they've accomplished, on the project list that has resulted from their efforts, what the priorities attached to that project list should be, and eventually, what the TGG priorities as a group should be, Schneider said.

With that, Schneider led a round of introductions and a review of the agenda.

II. Water Use Planning and Research.

Bonnie Antcliffe provided a presentation on "Laboratory Bioassays to Determine Dose-Response Relationships for the Effects of Dissolved Gas Supersaturation on Juvenile Fish in Static and Dynamic Exposures."

Antcliffe noted that this research is being funded by the provincial government in support of their water use planning process, which is being conducted for all hydroelectric facilities throughout the province. The intent of this project is to produce information that

is relevant for all British Columbia hydroelectric facilities, she said.

The highest TGP levels in the province are typically in the Columbia River projects, Antcliffe continued. TGP levels are lower at our Vancouver Island projects, where, in some cases, the maximum water depth below a project is only a meter, compared to 30 meters at the Columbia projects.

Antcliffe went through a lengthy series of overheads, touching on B.C. water quality guidelines for dissolved gas supersaturation, time to mortality for all species and sizes (lab tests show that 110% TGP protects all species and sizes from mortality), threshold equations for symptoms of GBT, compensation zones for signs of GBT, results from research into pneumatic duct release pressure, evidence of increased mortality in juvenile fish from swim bladder overinflation, and a summary of B.C. water quality guidelines for dissolved gas supersaturation. For further details, please contact Antcliffe at the B.C. Department of Fisheries and Oceans for copies of her overheads.

Antcliffe then moved on to factors not accounted for in B.C.'s DGS guidelines:

species susceptibility
fish size and life-history phase
individual variability
dynamic exposures (variations in TGP, flow, or water depth or fish behavior)
duration of exposure
Chronic effects (other than swim bladder overinflation)
cumulative effects (e.g. temperature)

B.C. researchers are looking into some of these factors, Antcliffe said:

Biological Impacts of GBT

Direct Acute Effects:

Gas bubble trauma

Indirect Acute and Chronic Effects:

external signs of GBT
Swim bladder overinflation
Growth, condition factor, blood chemistry
Swimming performance
Habitat displacement/avoidance behavior
Increased susceptibility to disease
Increased susceptibility to predation

Antcliffe then moved on to the proposed bioassays B.C. researchers intend to run,

using two sizes of juvenile rainbow trout (which are about three times more sensitive to the effects of GBT than other species, such as chinook) and cutthroat trout:

Proposed Bioassays

Direct Acute effects

1) Time to initiation of mortality and cumulative mortality (static and dynamic exposure)

Indirect Acute and Chronic Effects

2) Increased susceptibility to predation (static and, possibly, dynamic exposure).
3) Swim bladder overinflation

Antcliffe then described the experimental design for each of these bioassays in some detail. There were no questions at the close of her presentation.

III. Group Presentations.

A. System Modeling Work Group. Marshall Richmond led this presentation, working through a series of overheads, noting first that the group's objectives and model capabilities include:

perform an integrated assessment of the impacts of total dissolved gas on the Columbia Basin ecosystem
Provide a tool that can inform decision-makers on the performance of various structural and operational gas abatement alternatives, to help them prioritize the allocation of scarce resources.
Provide tools that can evaluate the elimination and transport of dissolved gas through the system, and relate that information back to an ecological impact.

In terms of the status of the work group effort, said Richmond, there is now a plan description available on the Internet; very few comments have been received to date, and we're at a stage now where we could use some feedback. There are a couple of other related modeling efforts ongoing in the basin; these include the modeling work the Pacific Northwest National Laboratories is conducting for the Corps of Engineers on the Lower Snake and Columbia River systems, and the ongoing Corps modeling work focused on hydrogeneration-related TDG production.

In terms of the one-dimensional analysis we're working on for the Corps, Richmond

said, that model has now been extended up to Keenleyside, the Pend Oreille River, the Hells Canyon complex and the ocean. The more detailed two-dimensional model is still focused on the reach from Lewiston to Portland; the other work Bolyvong Tanovan initiated through the Waterways Experiment Station is a more simplified management tool that starts at Grand Coulee and ends in the Lower Columbia. These are two efforts that are coming together to provide some very useful information, Richmond said.

With regard to priorities, Richmond continued, our recommendation is that the priorities for tool development should include a heavy focus on gas production under various operations; this information would feed into a one-dimensional analysis of the system. Other informational priorities identified by the modeling work group include:

Physical data – bathymetry, flows, temperature, wind speed
Project operations – spillway and powerhouse flows (bay and unit if possible), tailwater and forebay elevation
Tailrace and forebay TDG and water temperature monitoring – use for initial production estimates and model verification
Reservoir and reach-specific TDG, velocity, water temperature measurements – lateral mixing verification and TDG production
Reservoir and reach-specific meteorology

Basically, a lot of this data is already available, Richmond said; now we need to start pulling it all together. If we can take care of these first three things, he said, we'll be well on our way to developing a very useful tool for evaluating the differences between various options. The last bullet is probably the lowest research priority, he said.

So there is a one-dimensional and a two-dimensional model? Schneider asked. Yes, Richmond replied – the work we've done for the Corps uses both. We have all of the pools modeled, but basically, they are two different tools. The other tool, which is being developed by WES, looks at the production function – the relationship between power operations and TDG production. And the one-dimensional model extends up to Keenleyside now? Schneider asked. Yes, Richmond replied.

How is this being used now in the Lower Columbia? another participant asked. To develop rankings for the various gas abatement projects in the Lower Columbia, Richmond replied. So it's a planning, rather than an operational, tool? she asked. That's correct, Richmond replied, although it could be used as an operational tool as well.

B. Monitoring and Information Sharing Work Group. Mary Todd Uhlir of the Corps distributed a handout, "Computational Modeling of Dissolved Gas Transport and Mixing in the Columbia River Basin," dated September 11, 1999. She explained that this document includes a draft Monitoring and Information Sharing study plan, which lays out the available TDG data in the region, as well as a suggested approach to prioritizing the

projects for which data is and is not available. The plan describes what the subgroup has already accomplished, she said, as well as what we're still trying to accomplish; it also includes some estimates of the cost of gathering the additional baseline data needed to develop an international, systemwide data management system.

The goals we've accomplished so far include the identification of the existing TDG data sources in the US and Canada, Uhlir continued; we've prioritized the projects for which baseline data does not exist, and developed cost estimates to acquire that information. Some of the goals that have yet to be accomplished include the compilation of the missing baseline data, as well as the development of a standardized format, perhaps as simple as a gas production equation, she said.

The plan contains three tables, which divide the 133 Columbia Basin projects into three categories, said Uhlir. Table A includes sites on the mainstem or tributaries with known contributions of TDG above the state standards and/or Canadian guidelines/objectives (42 sites, two of which have no baseline data). Table B lists those sites on tributaries with little or no expected TDG contribution to the mainstem, or on tributaries contributing less than 20% of flow to mainstem or downstream tributaries (70 sites, 43 of which have no baseline data). Table C lists those sites where monitoring has shown little gas production, sites where there is little possibility of gas production above state standards and/or Canadian guidelines/objectives, or sites that contribute less than 10% of flow to downstream tributaries (21 sites, 17 of which have no baseline data). Table A, obviously, contains the highest-priority rankings, said Uhlir; Table B is the list of second-tier priorities, and Table C is our lowest priorities.

Uhlir spent a few minutes going through some of the cost estimates the group has developed for the collection of the missing data, and the options for gathering that data:

Option 1: Full-Scale Near-Field Study and Analysis. Short-period monitoring covering an acceptable range of flow, spill amount and spill pattern conditions and analysis of the collected data, including complete reporting (Cost: $50,000-$75,000 per smaller project and $75,000-$100,000 per larger project)
Option 2: Short-Term (1-2 Days) Transect Study. Deployment of 6-8 instruments, analysis and summary memo (Cost: $20,000-$30,000 per site or $15,000-$22,500 each for more than three transect studies).
Option 3: Installation of Fixed Monitoring Station. Construction of fixed monitoring station for installation and sheltering of long-term deployment gas monitoring probe. Probe requires regular maintenance/calibration and is capable of real-time transmission or data logging for future downloading (initial investment: $22,900; upkeep costs after first year's operation: $3,900 for travel, maintenance and data management).

The total cost of gathering baseline data for all of the Table A, B and C sites which

currently have no baseline data was estimated as follows:

Priority of Sites	Option 1 (in thousands)	Option 2 (in thousands)	Option 3 (in thousands)
Table A (2 sites w/o data)	$125-$175	$30-$45	$46
Table B (43 sites w/o data)	$2,150-$3,.225	$645-$968	$985
Table C (17 sites w/o data)	$850-$1,275	$255-$383	$389

Uhlir noted that one possible scenario for managing baseline data gathering as economically as possible would be to mix some of these options and proceed over a multi-year time-frame -- for example, in year one, we might install fixed monitoring sites at the two Table A sites for which no baseline data exists, and select 10 or so sites from Table B for at least some data gathering. In year 2, we could emply Option 2 for the remaining Table B sites, then use the information gathered to decide which Table C sites to investigate in year 3. The total cost of this three-year multi-option approach would range from $192,000-$241,000 per year, Uhlir said.

It seems to me that what's missing is a comprehensive gas production model, Larry Fiddler observed – if we had that tool, then our monitoring effort could be restricted to the level of effort needed to validate the model. That's true, Uhlir replied; however, models are only as good as their input. It is true, however, that, at some point, we do need to integrate our efforts with those of the modeling work group. I think everyone would agree that Canada has had a lot more success in integrating the biological component of gas production effects into their modeling than the U.S. has, she said; certainly we now have an opportunity to integrating the Canadian and U.S. modeling efforts.

Richmond asked about the actual cost of the spill needed to conduct these tests and studies; Joe Carrol replied that the cost in power losses for even a few days of testing can range from a few hundred thousand dollars to several million dollars, at some projects.

A lot of these systems are undergoing change, Fiddler observed – we can monitor today, but that information may be completely useless three years from now. In response to a question from Schneider, Uhlir said that all of the information she presented today is available via the Corps' Internet homepage.

C. Structural and Operational Work Group. Keith Binkley distributed two handouts, "Data Compilation for Major Dams/Flow Data at Major Dams in Canada" and "Project Timeline -- Dissolved Gas Structural and Operational Abatement." He noted that the Structural and Operational Work Group's draft work plan has been circulated for

review, and that he welcomes any input other TGG participants may have.

Binkley said the group's goals include approaching this question on a systemwide basis, to look at the biological implications of structural and operational gas abatement, the cost and the time it will take to implement these projects. We've developed a rough list of the projects that could use gas abatement measures; the characterization of those projects continues, he said. We need to compile that technological information, he continued, then move to a hydrologic assessment, looking at the capacity of each project, how frequently each project spills, the magnitude and duration of that spill, and the resulting TDG production.

Once we have that complete technical information, Binkley continued, we can refine our criteria for the prioritization of gas abatement work at these projects. After that, some sort of operational assessment will be needed; each facility will need to evaluate which operations are most effective in the suppression of TDG production. We need to look at each dam, reach and region, and the cumulative effects of TDG production within the system. The modeling and monitoring efforts will logically feed into that assessment, Binkley said. We then need to review the available gas abatement technology, assess which technologies are most appropriate for each project, and develop cost and time estimates.

In terms of next steps for this work group, said Binkley, to keep the momentum going on the compilation of data, we may need to hire a consultant to develop a scope of work; I don't think the costs will be huge or limiting – we just need to get going on this.

Questions? Binkley asked. I wonder if some of your data needs may be similar to the data needs of the modeling and monitoring work groups, Beatty said – perhaps there are some efficiencies there. I agree completely, Binkley said – we're definitely at a point of convergence.

One comment on the Corps' gas abatement fasttrack program, said Carroll – the Corps has developed an assessment of the gas abatement needs for the Lower River projects; there is a basis for moving forward with structural gas abatement at these projects. We intend to use that as a template for our work, Binkley agreed.

D. Biological Effects. Antcliffe said the major products completed by this work group include:

bibliography of TGP references
Briefing paper on Biological Effects and Research needs

Both of these items are available on the website, Antcliffe said. Next steps for the group include:

risk assessment analysis of fisheries (aquatic) resources at risk
detailed research plan to fill data gaps
information sharing

The Biological Effects work group has also identified the following budget needs, she said:

risk assessment
development of detailed research plan

The key upcoming decision points for this group include:

An expression of interest for development of a risk assessment and research plan
funding

So there is no need for funding for this work in Canada? Les Swain asked. Antcliffe replied that some of this work is ongoing, but there may be funding needs in the future.

IV. Group Priorities.

From what I've heard so far today, said Scott-May, our goal as a group is to develop an overall workplan, Catherine said, which will have a number of components. The first component is an assessment of the likely technical impact of any given project; the next step will be to move beyond that technical assessment to look at some of the other types of impacts from the operation of each project, including socioeconomic impacts. I'd like to have a bit more discussion about those potential impacts before we break for lunch, Scott-May said; after lunch, I would like to focus in on "doability."

We also need to have some discussion of the target audience for this workplan, she continued -- is it intended for a technical audience? For decision-makers? We should probably spend a few minutes discussing the most appropriate audience for this document, as well as the information needs of that audience. If we can define and stay focused on the projects with the largest potential impact, that, in my experience, is going to help us make the maximum amount of progress, given the limited resources of the group.

What I heard from the modeling work group, Scott-May continued, is that they have a number of goals, in terms of doing an integrated assessment, gathering additional physical data etc. It seems to me that we may have a point of convergence with the data needs of the monitoring and modeling work groups, she said; perhaps that information could be standardized so that it fits the needs of all of these groups. Uhlir agreed that this was the case. Also, said Scott-May, it sounds as though what you need, in terms of information-gathering and monitoring, is almost a geographic assessment of the projects

with the biggest impact. She wrote on the flip-chart:

Information standardization
Geographic prioritization

One thing we need to know is what information is most important to people right out of the chute, Uhlir said; we also need to know what depth we need to go into – is information from the tributaries important? What's missing, then, is a set of criteria that helps us make decisions about which projects and which data needs are most important, Schneider suggested. Maybe we just need to spend some more time looking at the tables and lists of projects, Uhlir replied. What we really need is to characterize the dams and how much gas they produce, suggested Reclamation's Kathy Frizell.

Scott-May wrote the following on the flip-chart:

What data level?
Criteria for refinement of three project tables

It seems to me, said Reclamation's Dave Zimmer, that we're in danger of losing focus if we try to pull in too many of the smaller systems and tributaries. What I'm hearing, then, is that the workplan's focus needs to be on the mainstem and the major tributaries, Scott-May said -- the systems and projects that are producing the vast majority of the dissolved gas. Fiddler noted that there is a major difference between the Canadian and U.S. approach to research prioritization; Canadian entities are more interested in the dose-response question, and the biological effects of dissolved gas on fish, while U.S. entities are more focused on physical TDG levels. That's something that needs to be recognized, he said, because there has been some resistance, on the part of U.S. agencies, to conducting the kinds of biological research many of us think is needed.

One other observation on the focus on the mainstem and tributaries, said Beatty -- from a Provincial point of view, because we're about to embark on this project-by-project water-use planning process, we're interested in overlaying many features, including the resources at risk. We want to try to layer in many of these values, so that we can protect the most critical resources -- especially listed species. I don't think we should throw the concept of looking at tributary systems out the window, she said -- there needs to be a balance between the resources at risk, and where we focus our attention.

In response to a question from Scott-May, Binkley suggested that one thing that is needed is a cumulative effects assessment, showing the effects of the operation of individual projects on gas production and, ultimately, listed species and other resources. My suggestion is that we look at the largets facilities first, in terms of total flow, geographic location and gas production, and screen them to see where critical information may be missing, he said.

Scott-May wrote on the flip-chart:

Cumulative effects

What I'm proposing is that we look at the largest facilities first, the ones that control flow throughout the system, Binkley said – we need to figure out what the big dams are in the system, including the tributaries, look at which already have monitoring programs in place, develop a plan for gathering the missing data, and then start building our model. As Marshall Richmond has suggested, he said, I think we need to get that model-building process underway, because that will tell us more about where the key data gaps lie than almost any other activity.

You also noted that there are similar data needs between the monitoring and gas abatement work groups, Scott-May said. Can you expand on that? Binkley replied that what is called for is monitoring above and below each facility under a range of spill and operational conditions, as well as an assessment of how those operations affect downstream facilities. Also, he said, I think the fixed monitoring is the most important priority in the near-term, and that the near-field studies can come some time in the future.

Scott-May wrote on the flip-chart:

Fixed monitoring first priority

Another observation is that we could take advantage of information that is being generated through other processes, such as the FERC relicensing processes in the U.S., another participant observed. There are a number of projects going through relicensing at the moment; as part of that process, the project operators are being required to generate the same kinds of information we require for this process.

I'm trying to envision what we can do as a group in the short term, said Uhlir; it would be very helpful if we could develop at least a basic model that looks at gas production and movement through the system, as well how power production affects TDG production.

The group spent a few minutes discussing potential modeling approaches; Richmond said his understanding is that one of the models currently under development is basically a spreadsheet model, which allows the user to quickly look at gas production, with some estimates of what gas levels might be in the forebay of the next project downstream, as well as how that ties back with power production. That would be a pretty good first cut, he suggested; the other models, which are being developed by the Corps, are somewhat more complex, providing more spacial resolution as well as a means to evaluate the consequences of various actions, including the removal of the Lower Snake dams. The

systemwide model approach can deal with real-time management strategies, including spill and power production, Carroll added.

The other three work groups have identified a coarse level/fine level approach to prioritizing information needs, said Scott-May -- is there similar tiering that could be done in a fairly short time-frame to the biological effects side? I think so, Antcliffe replied; Chris Pinney could probably address that from the U.S. side. I think, from what I've gathered, that the course screen model will at least give us an idea of where the potential problems are, added Beatty -- that really needs to be the first level of information-gathering we do.

Richmond noted that the key piece of information, for any model, is dissolved gas production. If we can come up with a list of dissolved gas production equations for the projects on our "A" list, we can probably develop this coarse screen analysis within a couple of weeks -- it's a fairly straightforward process. If you want to turn that into some kind of a management tool, he said, then you've got a little more work to do, but it won't be very difficult to develop a basic statistical look at where things are at. Where we're going to encounter problems is those areas where we simply don't have the data to support any sort of relationship between project operations and gas production.

The other issue is, when you change the system to reduce dissolved gas, your gas production equations go out the window, Fiddler said. Richmond replied that different modeling tools are used for different purposes; the screen approach might be useful in developing a management tool for today's system, but you're right -- it isn't going to get us there if there are major changes to the system and how it's operated.

Larry's point is well taken, said Carroll; the only tool we have for dealing with that is the higher-level model.

The model results have to be in usable form to inform management and operational decisions, said Scott-May. What I'd like to do now is go around the room and ask people for their ideas about how they might sell this proposal to their bosses.

Mary Lou Soscia said that, in the U.S., EPA, the tribes and the states are negotiating how water quality decisions are going to be made in the future. EPA has committed to making those decisions on a systemwide basis, she said; the key question is, how do we start to make that transition? Listening to the discussion this morning, it is apparent that the participants in this group have been working very hard to produce some really good information, she said; I would like to walk out of this meeting with a clear understanding of where we want to go with modeling in the future. Basically, said Soscia, we need some concrete ideas about the future direction of the Transboundary Gas Group's efforts.

Beatty agreed that clear future direction is needed, as well as a concrete idea of how this process will yield results that will enhance water quality improvement efforts in the future.

Patti Stone said she has brought up the following point at every meeting of this group: there is still a missing element, which is, what is going to help fish next spill season? That appears to have fallen off the table, for whatever reason, she said. While long-term goals and priorities are important, she said, the Colville Tribes are looking for operational changes that can be made by the spring of 2000.

Scott-May wrote:

Urgency -- short-term, long-term

Another participant added that monitoring and information-gathering decisions are relatively easy, in comparison to the much more expensive and difficult decisions about whether and how to abate gas at various projects on both sides of the border. Obviously, the standards are being exceeded at many projects; however, in the absence of strong incentives to correct the problem, many project operators will continue to do nothing. It might be useful for this group to spend some time thinking about what those incentives might be.

Scott-May wrote:

Incentives for negotiation and action

Gary Birch noted that B.C. Hydro has stepped away from this group, from a data collection perspective; while we're all aware that Keenleyside makes the most significant gas contribution to the system, on the Canadian side of the border, we've done everything we can, from an operational perspective, to reduce dissolved gas production, and the only additional thing we can do is something structural. Unfortunately, that dam doesn't really produce a profit, so any structural abatement fix isn't likely to happen any time soon.

Are the operational limitations to which you refer a result of the Treaty? Soscia asked. If the Treaty was structured differently, would there be additional operational alternatives available to B.C. Hydro at Keenleyside? As usual, there is no simple answer, Birch replied; if the decision had been made to install another turbine at the project, my belief is that that would have gone a long way toward solving the dissolved gas problems at that site. However, for economic reasons, it wasn't possible to do that. In terms of the Treaty operations, there are certainly times when the Treaty discharges could be modified to produce a reduction in gas production. Realistically, any further gas abatement measures would have to be something structural, and again, I'm not sure how that would be funded, he said. Anything this group can do to help? Scott-May asked. I notice in Keith's handout there is a line-item called "Literature review of current abatement technology," Birch replied; completing that review would probably be a good place to start.

Dave Zimmer described Reclamation's ongoing investigation of gas abatement alternatives at Chief Joseph and Grand Coulee Dams; he said that, from his agency's perspective, anything that reduces incoming gas levels to Grand Coulee would be helpful, because those high gas levels reduce Reclamation's operational flexibility. Also, he said, one of the concerns I hear about this group is the hope that it bites off a small-enough chunk to chew, in terms of the scope of the action plan. From Reclamation's perspective, we would like to see the TGG focus a good deal of effort on the Pend Oreille system, and anything that reduces the level of gas coming into the Grand Coulee forebay.

Scott-May wrote:

Doable action plan

Another Reclamation participant, Steve Sauer, added that, at Grand Coulee, Reclamation continues to try to maximize load during high-flow periods, in order to avoid spill at that project. There is also an ongoing biological study at that project, looking at the effects of dissolved gas on resident fish, Sauer added. We have also studied potential structural modifications at Grand Coulee; it appears that those would be quite expensive, which is why we're involved with the Corps in studying potential dissolved gas abatement measures at Chief Joseph Dam.

Patti mentioned the urgency issue, said Soscia; it sounds as though Reclamation is taking some steps to address gas abatement at Grand Coulee, at least operationally, in the short-term. Do you feel that you're making some progress, or are there some additional things you could be doing? Sauer replied that Reclamation and BPA, working together, have been successful in basically eliminating spill at Grand Coulee in recent years.

Les Swain observed that, in the context of everything he has heard today, it is important to realize that we aren't going to be able to afford to fix all of the dams; we need to concentrate on the worst gas producers, and get the show on the road – Patti's comments about urgency are right on, he said, and we need to get moving. Swain suggested that in some cases, such as Keenleyside, some sort of cost-sharing arrangement might be appropriate -- if Keenleyside really is the only major problem on the Canadian side of the border, from a gas production perspective, perhaps some sort of a cooperative funding effort, involving the other Canadian power producers, would be a way to implement the necessary structural fix at that project.

BPA's Tom Foeller observed that a short-term opportunity exists at Brilliant Dam, in terms of encouraging greater expansion at that project; perhaps by supporting that expansion, this group can help bring political pressure to bear to help make that happen. From BPA's perspective, he added, we think this group offers an excellent opportunity to leverage our dollars and resources to maximize the gas abatement benefits those resources

produce. However, I need some concrete work products to take back to my bosses, if BPA is to help fund this effort in the future.

Russell Harding commented that he is usually very quick to become frustrated with forums like this; for two reasons, he said, I am not frustrated with this one. First, the Transboundary Gas Group is the only body looking at this problem in a systemwide way; second, Oregon occupies the lowest geographic position in the Columbia Basin, which is unfortunate on two levels: first, we consistently see dissolved gas levels that exceed the state water quality standard, and second, our water quality regulatory agency has an unusually crisp focus on standards attainment. We are under a great deal of pressure, from the federal regulatory agencies, from the state legislature and from the federal judiciary, to see that those water quality standards are met, Harding said. If we continue to strive toward abating gas in Oregon, but that commitment is not shared in other parts of the Pacific Northwest, then the cost of gas abatement will be disproportionately borne by those facilities within Oregon.

In other words, Harding said, Oregon has a major stake in the success of the TGG's efforts. What we need, however, is some specificity about the particular measures that are going to be taken, not just in Oregon but at every gas-producing project in the Northwest.

Gary Passmore of the Colville Tribes reiterated Stone's earlier comment about the need for this group to seek short-term gas abatement opportunities; he agreed with several earlier commentors that the TGG's focus needs to be on major gas-producing projects first.

Cliff Sears of Grant PUD said that, from his utility's perspective, it would be interesting to know how far, geographically, the impact of high TDG levels from Canada extends into the U.S. Our projects are located a couple of hundred river-miles from the border, he said, and I would frankly be surprised if any of the high TDG levels seen at the border were impacting our facilities. He added that Grant County is interested in pursuing more spill-for-power trades as an additional means of operational gas abatement. Sears also said that, given the fact that the new Biological Opinion may require additional spill at longer duration, he is extremely interested in the kinds of biological investigations some of the TGG's Canadian participants are pursuing.

Bev Raymond said that, from her perspective, the issues in the Columbia Basin are complex; in terms of negotiation, the types of swift action Patti is talking about will be difficult to achieve. Environment Canada is participating in this forum primarily for information exchange, she added.

Schneider adds that he, like Swain, is anxious for this group to make tangible progress. One of the things I heard this morning is that there is a sense of urgency, with respect to the modeling and monitoring efforts, he said; I would like to see this group

pursue those activities with some sense of urgency.

V. CRIEMP TGP Monitoring Project and Brilliant Expansion.

Dana Schmidt of RL&L Consulting provided a comprehensive presentation on the summer 1999 Columbia River Integrated Environmental Monitoring Program (CRIEMP) TGP monitoring project on the Kootenay, Columbia and Pend Oreille Rivers, as well as the possible effects of the expansion and upgrade of the power plant at Brillant Dam on TGP levels in the Kootenay River.

Schmidt noted that the CRIEMP study was jointly funded by B.C. Hydro, the Columbia Power Corporation, COMINCO, West Kootenay Power and the City of Nelson. He then went through an extensive series of overheads, touching on the geographic scope of the study, the methodology and equipment used, and results, from South Slocan, Lower Bonnington, Keenleyside, Brilliant, Waneta and Boundary Dams. Schmidt also touched on recent gate testing work at Brilliant Dam, the goal of which was to see whether different spill gate configurations could reduce TDG production at that project; he said this information will ultimately be entered into a model to develop a gas abatement plan for Brilliant.

In summary, Schmidt said there is very little TGP problem in Kootenay or Arrow Lakes; there are relatively high TGP levels entering the system above Boundary Dam during the spill period, coming in from the U.S. projects on the Pend Oreille River. The major TGP contributors on the Canadian side are Lower Bonnington and Brilliant Dams on the Kootenay, particularly Brilliant Dam; Keenleyside Dam and Boundary Dam, during the spill period, as well as Waneta Dam.

During the 1999 spill period, Columbia River TGP values at the border were significantly below those of individual systems, because of the timing of the contributions, Schmidt continued. TGP contributions were relatively evenly split among the Pend Oreille, Kootenay and Upper Columbia systems; given the annual water release timing and variations in the natural hydrograph, these systems will contribute different components from year to year, he said.

Schmidt emphasized that this is preliminary information; there has been no analysis of this data to speak of. However, the problems are obvious, and it is readily apparent where gas is being produced in the system, he said.

With respect to the upgrade of Brilliant Dam's generating capacity and the anticipated effect of this work on TDG production, Schmidt said a variety of scenarios are under consideration; most would increase the existing powerhouse capacity at Brilliant (currently about 18 Kcfs) by 50%-100%. Obviously, he said, that will result in a proportionate decrease in the volume of spill and TDG produced at that project. Even if the existing units are upgraded and another 80 MW powerplant is added, however, some

spill would likely occur during the freshet in most years at Brilliant, Schmidt said.

Schmidt said some simple projections of the effects of the Brillaint upgrade on TDG levels at the Boundary have been done; if the additional 80 MW powerplant option is chosen, the number of days during which the 110% standard is exceeded at Boundary is projected to drop from 112 to about 90; if the 150 MW powerplant option is chosen, that number would fall to about 80 days. That gives you some idea of the level of TDG Brilliant contributes to the system, Schmidt said.

Schmidt made copies of his overheads, as well as information papers on the CRIEMP monitoring program and the Brilliant expansion, available at the meeting; please refer to these documents for details of his presentation.

VI. Implementation Strategy for Top Priorities.

Scott-May asked the group to split into three subcommittees to brainstorm about the TGG workplan. She asked the groups to think about coarse-level analysis -- things that can be done in the near-term to address urgent needs -- as well as fine-level analysis, the more methodical, long-term issues which need to be addressed within a systemwide TDG abatement plan. We will then meld the output of the three groups into an action plan for moving forward, Scott-May said.

After a half-hour or so of deliberation, Scott-May asked the first TGG work group, charged with identifying short-term information needs and mitigative measures, to report their findings. In terms of coarse-level analysis, said one participant, we think it is crucial that the list of projects be screened to identify gas-production hot-spots; we can then develop a regression for each facility which relates gas to flow. It should be possible to complete that work within the next three to four months, using existing monitoring data, he said. So over the next three to four months, using existing data, you feel it should be possible to fine-tune the screening tool, apply it to the list of facilities, identify hot-spots and do some comparison and assessment of scenarios? Scott-May said. That's correct, the participant replied.

What about biological factors? Scott-May asked. One of the concerns I heard was that over-concentration on major facilities may not capture the areas that are significant to some of the species at risk -- is there some sort of coarse-level analysis that could be done to identify what we might call biological hot spots? Fiddler observed that one of the key biological data gaps, in his opinion, is fish behavior; at many of the projects of concern, we have no idea what depths the fish use. Actually, I was thinking more about trying to get an assessment of the biological hot spots in the system over the next three to four months, using existing information, similar to what we're talking about doing with gas production hot spots, Scott-May said.

After a few minutes of discussion, Fiddler said there is a model available which can

be used to track fish through the system. Would that be a logical step, in terms of a useful coarse biological analysis? Scott-May asked. That would at least give you a basic comparison of the gas production and biological hot spots in the system. I'm not really sure how useful that would be, said Joe Carroll; until we fill the fish behavior gap Larry just referred to, any modeling will be based solely on probability and guesswork.

It sounds, then, as though what you're suggesting is that we need an assessment, using the screening tool, of where the gas production hot spots are, then a further assessment or ranking of those hot spots in the context of the most important aquatic resources, Scott-May said. That assessment would be done based on what we know, currently, and could be done at the same time we do an assessment of various scenarios for reducing gas production at the facilities of concern. Essentially, she said, what we're laying out here is a process by which you would develop a ranked list of gas production hot spots, then re-prioritize that list based on increasingly-complex factors -- the presence of species of concern, potential mitigative actions and the feasibility of those mitigative actions. The ultimate goal, of course, is to produce a list of projects, measures and priorities that give you the biggest bang for your buck; the prioritized list of hot spots might also help you focus your effort to identify short-term operational measures to reduce gas production while you complete your long-term planning, she added.

In terms of the specifics of who will do this work, Scott-May continued, first, who would it be appropriate to ask to do the regressions for each project. A consultant, replied one participant -- we're estimating that it will cost between $50,000 and $100,000 to develop those regressions. Ideally, he added, that contract should be issued and administered through BPA.

What about the evaluation of the list of gas production hot spots in the context of critical fish and aquatic resources -- who would like to take that on? Scott-May asked. Bonnie Antcliffe noted that this information already exists on the Canadian side of the border; Soscia noted that such an assessment probably is not needed on the U.S. side, because there are already biologically-based criteria and applicable laws in place to guide mitigative actions. It would probably be appropriate to simply include a description of our criteria and standards in the U.S. part of this section of the plan, she said. Who will take the lead on pulling that information together on the Canadian side, so that it can be fed into this process? Scott-May asked. After a few minutes of discussion, it was agreed that CRIEMP will put this information together.

What about the identification of potential mitigative strategies to reduce gas and their feasibility? Scott-May asked. Fiddler noted that much of this information has already been developed for the Canadian projects, such as Brilliant and Keenleyside. Schneider suggested that what is needed is a brief, one- or two-page description of the scope of work, objectives, estimated time, cost and level of effort for each of the short-term projects. It was agreed that this would be a worthwhile effort; it was further agreed that these brief project descriptions will be completed within two weeks, so that the steering committee can

begin to seek funding.

Next, Scott-May asked the long-term planning work group to report their findings. Mary Todd Uhlir said the main item identified was the need to identify and integrate the list of necessary structural and operational changes at the Canadian and U.S. projects. The group spent a few minutes discussing the different U.S. and Canadian views of the need to develop information on the biological effects of dissolved gas; Fiddler reiterated the Canadian perspective that, in the context of the TGG workplan, biological research is needed to feed into the models and, ultimately, to allow project operators to predict the biological impacts of dissolved gas production and mitigative measures. The predictive model would help inform our systemwide decision-making process, in other words, added another participant.

What about mitigative measures, and the long-term needs in that area? Scott-May asked. One thing the group discussed was the fact that the Corps' Gas Abatement Program has been in place for five years now, said one participant; it has involved a tremendous amount of effort and expense, and it would be a little presumptuous for this group to start prescribing what they should be doing. It sounds, then, as though the main long-term work effort consist of getting a better handle on the biological effects, in an effort to better focus the limited analytical and mitigative resources on the most critical hot-spots, Scott-May said.

I was interested in Patti Stone's comments earlier today about the need to explore short-term operational measures to reduce gas production next spring, Soscia said -- where does that fit into this discussion of our upcoming tasks? In our discussion of short-term projects, we said there may be some opportunities to make recommendations about potential operational changes, through the scenario assessment process, Scott-May replied. Given the fact that tomorrow is October 1, said Soscia, it is probably fairly critical to make some more specific work assignments, if those potential operational measures are to be identified in time for implementation next spring. After a brief discussion, Schnieder suggested that this would be an appropriate topic for the steering committee to discuss, once the above-mentioned project descriptions have been received.

Schneider added that a brief description of the long-term projects is also needed so that funding can be pursued. One participant noted that the biological research question is primarily a Canadian issue; unless this group is interested in making it a Transboundary Gas Group issue, it will continue to be a Canadian program. It was agreed that Antcliffe will keep the group apprised of any new biological research data that comes to light.

Schneider said that, during the work group discussion he participated in, he and Dave Wilson had discussed how spill management might be approached; we talked about the possibility of modifying the existing spill management tool which is now being used at U.S. projects during the spill management season so that it could be applied at projects outside the current spill program. We would like to explore the possibility of expanding

that tool to include projects above Grand Coulee and Hells Canyon, Schneider said; basically, we would need to develop a framework for implementation, and to identify someone from the U.S. and someone from Canada who could undertake that task.

Schneider added that he will be checking with the co-chairs of the four TGG subgroups to be sure that none of the projects they have identified have fallen through the cracks. If there is something that hasn't made its way onto the flip charts today, he said, I will ask them to develop a brief written description of that project, so that the steering committee has a full list of the projects that have been identified over the past year and a half by the Transboundary Gas Group.

This has been a very important meeting for the Transboundary Gas Group, Schneider said; now we need to get some concrete work products out on the table, within a very short time-frame. Soscia echoed these remarks, saying that, unless the TGG begins to make substantive progress fairly soon, the U.S. EPA may have to seek other avenues in which to address water quality issues and Clean Water Act compliance.

Schneider thanked everyone for traveling to today's meeting, and for all of their hard work in developing the various presentations and work products on the agenda. He and Bev Raymond extended a special thanks to Scott-May for her efforts in facilitating today's meeting.

VII. Next TGG Meeting Date and Agenda Items.

The next meeting of the Transboundary Gas Group was set for Thursday, March 16, in Spokane, Washington. Meeting notes prepared by Jeff Kuechle, BPA contractor.