Water Quality Team/2005 Spill Season
Year-End Review Meeting

November 8, 2005

1. Greetings and Introductions.

Today's WQT year-end review meeting was chaired by Jim Adams. The following is a summary (not a verbatim transcript) of the topics discussed at this meeting. Anyone with questions or comments about these notes should contact Kathy Ceballos at 503-230-5420.

2. Review of 2005 Spill Season and Preliminary Look at 2006 Spill Season.

A. Portland District. It costs about $200,000 per year to maintain our 8 sites, said Jim Britten; much of that cost is associated with leasing that equipment, so we're thinking about buying. One issue that arose last year was whether to continue monitoring at Warrendale, or to monitor only at Cascade Island, during the winter months; we decided to do both. Another issue that has arisen is whether or not to keep the Camas/Washougal gauge, the lowest Fixed Monitoring Station in the system – it is supposed to represent the Bonneville tailrace-estuary reach, and discussion about whether it is the best site to do that is ongoing.

Mark Schneider said the Corps has let a small contract to develop a report on recent literature and data about TDG in the reach below Bonneville; that project is underway, and the draft report from Battelle NW will be available by December 1. We'll need to get that report before embarking on a substantive discussion of the Camas/Washougal FMS issue, he said.

Mike Schneider said he has been compiling the physical data collected since the Camas/Washougal FMS became operational in the mid-'90s, to look at the data on dissolved gas, water temperature, project operations and tributary flow, in an effort to characterize the physical habitat below Bonneville in a summary report. That report is in draft form right now and is being reviewed, Mike Schneider said. We'll need that report in order to take a comprehensive look at dissolved gas in the reach below Bonneville, said Adams. Another participant noted that he has been compiling data at Kalama and other sites.

Dwight Tanner then led a presentation titled "Total Dissolved Gas Monitoring –

Lower Columbia River." He touched on the following topics:

- Eight monitoring sites (map)
- Field checks – Hydrolabs switched out every two weeks, field calibrations done
- Explanation of a boxplot
- Field check results – almost all checks within 1%

The group devoted a few minutes of discussion to the factors influencing calibration, particularly at JHAW1 and Cascade Island. Moving on, Tanner touched on

- Lab calibration techniques
- Lab calibration results – results generally within 0.4% of accurate
- Data completeness for water year 2005 – average for all eight stations: 98% (from a low of 88.9% at Cascade Island to a high of 100% at The Dalles tailwater station). The relatively low number for Cascade Island was due to the need to delete a number of anomalous readings in early March. From April 1 on, the Cascade Island station operated at 98% efficiency.
- Seasonal exceedance of TDG standards (box plot) – highest number of exceedances: 11 at Warrendale
- Future plans – USGS will publish a report covering the material in this presentation; much equipment will be replaced and upgraded for 2006; new barometers to be installed at many sites
- Summary: The accuracy of the TDG sensors was +/- 0.4% when compared to a primary standard (in the lab); 98% of the 2005 TDG data was received in real-time.

There were no questions following Tanner's presentation.

B. Seattle District. Kent Easthouse led this presentation, titled "Total Dissolved Gas Monitoring 2005: Chief Joseph, Albeni Falls and Libby Dams." He touched on the following topics:

- Introduction: five monitoring sites, seasonal (April 1-September 30), sites recalibrated every two weeks
- Location of sites (map)
- TDG monitoring 2005 – equipment by site (Hydrolab MiniSonde 4a TDG sensors, Geomation DCPs, radio transmission)
- These sites not monitored during the winter – they were pulled out last week, but could be reinstalled during the deflector work if needed
- TDG Data completeness, 2005: ranged from 81% (Albeni Falls tailwater) to 98% (Chief Joseph forebay). All sites except Albeni Falls tailwater were in the 96%+ range.
- Temperature data completeness, 2005 (same basic pattern)
- Overview of 2005 TDG and temperature data – DCP malfunctions, programming problems and physical problems, including sedimentation and a torn membrane

reduced data completeness at the Albeni Falls tailwater site

- TDG and Temperature QA/QC 2005 (table) – generally quite accurate, although there were some problems at ALFW until it was moved
- Overview of QA/QC data
- 2005 spill season results for Chief Joseph Dam: forebay TDG levels periodically exceeded 110% from June 16-July 28, largely a function of the Grand Coulee tailwater TDG levels. Tailwater TDG also periodically exceeded 110% during the summer period.
- Chief Joseph tailwater temperatures exceeded 20 degrees C for most of August and September
- 2005 spill season results for Albeni Falls Dam – exceeded 110% periodically from late May through June, largely a function of upstream TDG levels; tailwater TDG exceeded 110% several times during the 2005 spill season. Forebay temperatures exceeded the 19-degree C IDEQ standard in July and August
- 2005 spill season results for Libby – no exceedances for TDG or temperature
- Conclusions: Fixed monitoring stations at Chief Joseph and Libby were representative of river conditions; the Albeni Falls tailwater station performed poorly until it was moved.

No questions were offered following Easthouse's presentation.

C. Walla Walla District. Greg Ruppert led this presentation: "QA/QC Evaluation of 2005 FMS TDG Monitoring Data: Walla Walla District." Among the highlights:

- Walla Walla District FMS (map)
- Site changes: four forebay sites moved upstream from the face of the dams to the guide walls; depth increased from 15 to 50 feet.
- Field equipment used – 48 Hydrotech ZS sondes, Honeywell analog barometers, Heise calibrated digital pressure gauges, Barnant digital thermometers
- Data completeness, 2005: 98.7-99.5%
- Missing/anomalous BP and TDG data (table) – only 1.28% of all data in 2005
- The effects of circulation problems – obvious and subtle (graphs)
- Membrane failures – five in all in 2005
- TDG sensor vs. primary standard, (lab calibration results) – all measurements with 2 mm
- TDG sensor vs. primary standard – barometric pressure (results more varied post-deployment)
- Water temperature results: lab testing vs. post-deployment – all results within 0.2 degrees C
- Water temperature readings – field checks: some variance
- TDG readings, field checks: some variance
- Summary: 16 sites, 8 year-'round; less than 2% missing data; overall, TDG and temperature data was pretty tight.

Why did you drop the probes to 50 feet? asked one participant. At the Lower

Snake dams, it's pretty well-documented that there is a fair amount of downwelling, which can lead to temperature and TDG spikes, Joe Carroll replied – if you move them upstream, to 50 feet in depth, you will avoid those effects, as well as the surface high temperatures seen in the Lower Snake pools. The goal was to reduce ambiguity and surface thermal spikes, he explained.

D. USBR. John Lemons led this presentation, touching on the following topics:

- The locations of the fixed monitoring stations operated by the Bureau of Reclamation: Boundary, Lake Roosevelt, Grand Coulee tailwater, Hungry Horse tailwater.
- Hungry Horse discharge vs. TDG, 2005
- 2005 USBR barometric pressure calibration protocols – all fell within 2 mm
- 2005 USBR temperature calibration protocols and results – all within 0.5 degrees C
- 2005 USBR TDG calibration protocols and results – somewhat more variability
- Comparison of FMS TDG readings to known values – no major problems
- 2005 data completeness based on CHROMS monthly data sets (table) – 94.3-100%, by station; most missing data due to transmission problems
- Plans for 2006: no major changes.

Do you find any major differences between the Alpha Designs and Hydrolabs instruments? Carroll asked. In terms of accuracy and how they hold their calibration, no, although there are some differences in terms of controls and how they're set up, Lemons replied.

E. Douglas PUD. Rick Klinge led this presentation – "2005 Spill Season Year-End Review – Douglas County PUD," the 2005 data for Wells Dam.

- Monitoring period – April 1-September 15. Hydrolab sensors used in both forebay and tailrace; calibrated monthly. Sensor also collect temperature and river gas pressure data
- 2005 conditions: flows were 93% of monthly average, April-September, of past 20 years. Flows peaked at 222 Kcfs on May 25, resulting in forced spill of 17.6 Kcfs for a short period.
- JBS operated from April 12-August 26.
- There were 102 hours of forced spill during the 168 days of monitoring; 42 of those hours were part of the test Douglas conducted.
- Conditions seen, 2005– daily average flows for power, spill and bypass operations, Wells Dam, 2005 – April 1-September 15
- Currently, a unit rewind has reduced Wells from 1 units to 9 units; the 9-unit condition will continue until all 10 units have been rewound, a condition that is expected to persist for 2-3 years
- 2005 QA/QC activities and outcome: in season, data "lock-up" was a problem for the barometer, forebay and tailwater sensors; an alarm has now been set to

notify when repeat values are logged. Data removed 2 hours post-calibration.

- 2005 forebay data QA/QC: 97%
- 2005 tailwater QA/QC: 96%.
- Preliminary results (graph): 12-hour TDG, forebay and tailrace, April 1-September 15
- 2005 Wells Dam hourly TDG, April 1-September 15 (graph) – only one hourly exceedance of 120%+
- Summary of investigations for 2005: tested operational fixes to reducing TDG at Wells in 2005; 8 scheduled spill events from 33-50 Kcfs; spilling over loaded units/unloaded units on the east/west side of the project; crowned spill/flat spill; each test lasted 3 hours; sensors array at 1,100 feet and 3 miles for the FMS
- Operation, spill vs. total flow during test operations, by scenario (table)
- Summary of investigations, 2005: did not see any advantage from flat spill; flat spill may create more "gassing" of turbine discharge; further analysis and review of this year's information is pending.
- Frequency of sensor calibration and results – done monthly; all sensors passed integrity check (table): in short, monthly calibration appeared to work well in 2005

No questions or comments were offered following Klinge's presentation.

F. Grant PUD. Ross Hendricks briefed the group on Grant County PUD's 2005 TDG monitoring efforts. He touched on the following major topics:

- Results: the 2005 season was uneventful.
- Monitoring requirements, parameters, intervals and technology
- Monitoring sites: Wanapum Dam forebay and tailrace, Priest Rapids Dam forebay and tailrace
- Calibration methods – bi-weekly calibration, following USGS guidelines; conducted in the lab; newly-calibrated probes replace in-service probes the next day
- QA/QC methods
- QA/QC – 2005 preliminary results: only 2 probe-related site visits; software and communications issues were the primary source of problems. Data completeness average 99.4% over the season.
- TDG: preliminary results (table) – Wanapum tailrace rarely exceeded 115% never exceeded 118%; no problems in Wanapum tailrace. At Priest Rapids, there were more problems, but in general, the 2005 TDG results looked pretty good.
- Conclusions: Grant will continue to monitor TDG and temperature on an hourly basis year-round; no major changes are planned to the program in 2006.

No questions or comments were offered on Hendricks' presentation.

G. Modifications to TDG Monitoring Strategies. The Corps put together some QA/QC criteria, which were approved by the WQT, said Adams. It appears, from what I'm hearing that everyone except Douglas and Chelan County are using those

recalibration criteria. What are the pros and cons of extending recalibration out to three or possibly four weeks? Adams asked. We have heard Rick Klinge say that Douglas saw no problems with the calibration of their instruments although they recalibrated monthly. True, Klinge said – the issues we saw in 2005 were unrelated to calibration. I would add that recalibrating once a month can actually reduce electrical/data transmission system problems, because you're not having to disconnect and reconnect the probes as often, added Lemon – in other words, more handling can lead to more problems.

What's the biggest risk associated with leaving the units in for a month? Adams asked. In our experience the membrane could break, or have moisture build up inside of it, Tiffan replied. If the membrane breaks, that will produce sudden and obviously anomalous readings, he said; moisture buildup can skew your readings one way or another, but more subtly. In my view, he said, three weeks is probably the most workable intervals. Another participant noted that the primary advantage of recalibrating every two weeks is in catching subtle drift in instrument calibration – when you drop in a redundant unit, and see that the field unit is just slightly off, that may not seem all that significant, but it does affect data accuracy across the season. If you go to recalibration every four weeks, the magnitude of that drift could be magnified; I would be more comfortable with recalibration every three weeks, he said – particularly during big spill years, having your TDG calibration off by even 1% can be a major problem.

After a few minutes of additional discussion, it was agreed that it may make sense to consider retooling the QA/QC criteria to require a three-week recalibration period, rather than a two-week period, at least during the non-in-season management period. Mike Schneider noted that his SYSTDG group is in the process of enhancing its ability to identify anomalous data coming from a given FMS; this may be another way to help the region decide which instruments are in need of recalibration, and when, he said.

Is there anything to suggest that there may be a seasonal influence on when problems occur? Adams asked. There is some information that leads me to believe that the problems occur more frequently during the summer, Tiffan replied. It would certainly make sense to me that we would want to recalibrate more frequently during the in-season management period, Adams said. He noted that the Corps will be incorporating today's discussion into its 2006 monitoring plan, which should be available for WQT review at that group's December meeting.

Jim Irish noted that there are 70 years of flow data on which spill targets could be based; that would be another means of identifying which fixed monitoring stations are reading accurately and inaccurately. It's a bit like a flat-rate income tax, he said – if we're seeing X amount of flow, we should have the data to say, here's the amount we can spill without exceeding the gas caps.

Another participant noted that his agency maintains 16 fixed monitoring sites;

some, such as the Peck gauge, are definitely more influenced by local conditions, such as turbulence or sedimentation, than others. It may make sense to consider different maintenance schedules for some gauges, even if you were to go to a three-week calibration schedule for others, he said. We could consider that, but intuitively, it just seems wrong to me, said Mark Schneider. In my view, however, the real question is the quality of the data, not about standardizing how you treat the instruments, Carroll observed. In my view, it would make more sense for you to give us a data quality objective, such as 95%, and let us meet it as best we can, added another participant. As long as your procedures are well-documented, that may well be acceptable, Adams replied.

Adams raised the question of wintertime monitoring – what are we doing incorrectly, and what should we be doing differently? If we were to follow the TMDL, we would be monitoring in the tailwater of the eight mainstem dams, plus Warrendale. That's not what we're doing, however, Adams said. The norm is to have both forebay and tailwater stations, because if one or the other isn't functioning accurately, that will help identify such problems, said one participant. For years we did no winter monitoring, he said; then there were a couple of key high flow/spill events, in '96 and '97, during which we had no instruments in place. If we had, it's possible that we wouldn't feel a need to do wintertime monitoring. Still, how would that change our decision-making process, in terms of how we deal with sudden winter flow events? Adams asked. Very little, the participant replied – during a surge flood event, you're still going to have to spill.

We know a lot more now than we knew 10 years ago, Mark Schneider observed – if we knew then what we know now, we might well have made some different decisions. We also didn't have the gas abatement structures in place back then that we have in place now, Adams observed. Another tool we have now that we didn't have then is SYSTDG, he added – would a SYSTDG analysis that showed, say, gas levels of 118-119%, be acceptable to the states? I would add that if your flows exceed 7Q10, as was done in '96-'97, the state standards don't apply, said another participant.

Do we need to monitor every single project during the winter, as the TMDL recommends? Adams asked. You're required to monitor during the spill season – it's up to you whether you want to monitor outside that period, Agnes Lut replied.

With that, today's meeting was adjourned. Meeting summary prepared by Jeff Kuechle, BPA contractor.