COLUMBIA RIVER TECHNICAL MANAGEMENT TEAM
April 25, 2018
Facilitator's Summary
Facilitator: Donna Silverberg; Notes: Nancy Pionk, DS Consulting

The following Facilitator's Summary is intended to capture basic discussion, decisions and actions, as well as point out future actions or issues that may need further discussion at upcoming meetings. These notes are not intended to be the "record" of the meeting, only a reminder for TMT members. Official minutes can be found on the TMT website:
http://www.nwd-wc.usace.army.mil/tmt/agendas/2018/

Dworshak Operations
Alfredo Rodriguez, Corps, reported on current and proposed operations at Dworshak. He presented several charts that are available on the TMT web site. Current reservoir elevation is 1480 ft. with 12 kcfs inflows and 4.7 kcfs outflows. The outflows are lower due to a diving operation at the dam which included a request to close the gates from 0700 to 1800 hours. He expects that outflows will increase to 7 kcfs after the operation ends later today.

TDG levels in the river below DWR decreased from 110% to 107.5% and from 100% to 99.7% in the hatchery. The TDG level at Peck is currently 102.5%.

The current RFC water supply forecast for the Clearwater Basin is 2.9 MAF with 5 days QPF. The short-term inflow forecast is expected to be 20-22 kcfs, with the weather expected to be warmer and drier. He noted that the snowpack is still tracking 2011 in most areas.

The 6-10 day meteorological forecast is expected to be warm and wet as there is an equal chance regarding temperature and about normal precipitation. For the 8-14 day forecast, temperature is about normal and there is an equal chance regarding precipitation. This holds true until the 30-day forecast, when there is an equal chance regarding temperature and below normal chances of precipitation. For the 90-day forecast, the temperature is expected to be warmer than normal with below normal precipitation levels predicted. The ten-day outlook does not show significant precipitation for the basin. The night-time temperatures are warming up, freezing levels are high in the basin, and runoff is expected.

In reviewing potential operations for the future, he noted the planned operation would reduce outflow from 7 kcfs to 4.8 kcfs by May 1 and then to 2.4 kcfs by May 10 as refill begins. If inflows are high, they may need to go higher. Unit 3 is still on schedule to be available by July 1.

He noted that the next report regarding Dworshak operations will be in mid-May regarding temperature operations, unless additional reports are requested. Erick Van Dyke, Oregon, requested that graphs relating to the SNOTEL readings and Water Supply be included in the mid-May report on temperature operations.

> **ACTION:** The Corps will include the graphs relating to the SNOTEL readings and Water Supply in future reports on Dworshak Operations.

Spring Spill
Dan Turner, Corps, presented on Spring Spill for the Snake River and lower Columbia River projects, using a series of charts and graphs that provided water quality information on Spill Caps, Daily Spill, and TDG, which are attached to today's meeting agenda.

Dan indicated that there have been many exceedances of the gas gap in the downstream forebays at both the Snake River and lower Columbia River projects. He observed that there has been very little wind over the last few days and little to no degassing has occurred between the tailwater and the downstream forebay, resulting in the decision to reduce spill caps. Additionally, TDG from the upstream forebay is not mixing with the lower TDG from the powerhouse, as has been observed in past operations. In addition, they have observed up to a 3% change in TDG saturation due to changes in barometric pressure. He has not observed clear swings in TDG due to temperature changes, but will watch for that, as suggested by salmon managers.

In looking to the future, Dan reported that the forecast shows an increase in flow and projects may be looking at involuntary spill. Involuntary spill at the Snake River projects may begin between April 27 and April 29 and at the lower Columbia projects on April 29. He anticipated that additional adjustments to the spill cap may be needed to control for the involuntary spill.

TMT members noted the challenge in this year's spill to gas cap operation being done to benefit migrating juveniles. All are watching the actions and realize the targets are hard to hit. In order to understand the mechanics of TDG production and distribution, members requested that Dan provide a write up describing the forebay calculations he is using.

> **ACTION:** Dan will provide a write up of his forebay calculations prior to the next TMT meeting and then lead the group through the calculation at the meeting.

Lower Monumental Operations

Ann Setter, Corps, requested the region's support for a modification in spill patterns at Lower Monumental to allow bulkheads on Unit 6 to be installed. She noted that crews were having difficulty installing the bulkheads due to turbulence in the tailrace from spill.

She proposed that the installation, which is expected to take no more than 3 hours, be timed to coincide with the daily barge crossing. During that time, spill is reduced for navigation safety. In the event that additional time is needed after the barge crossing, she proposed that the spill pattern be modified to shift spill to Bays 1-5 in a Uniform Pattern and close Bays 6-8 until the installation is completed. The spill cap would be resumed at that time. She was fairly confident that these actions would reduce the turbulence and allow the bulkheads to be installed.

Ann requested that TMT members be polled regarding the Corps' proposal:

NOAA: OK with the proposal;
WA: OK with the proposal;
OR: Oregon is concerned about the impact on fish; however, Oregon will not oppose;
MT: No objection;
ID: No objection;
Nez Perce: No objection;
Umatilla: No objection;
BOR: No objection;
BPA: Supports the Corps' proposed operation;
USFW: No objection;

TMT members noted that the best practice is to go through FPOM regarding these requests; however, it was understood that was not possible given the time constraints. Instead, a MFR after action would be appreciated.

The next regular TMT meeting will be a Face-to-Face Meeting on May 2, 2018, at 9:00 am.

This summary was prepared by the impartial facilitation team of DS Consulting. Please send questions, comments or revisions to nancy@dsconsult.co

Columbia River Regional Forum
TECHNICAL MANAGEMENT TEAM OFFICIAL MINUTES

April 25, 2018
Minutes: Pat Vivian

1. Introduction

Representatives of Idaho, Oregon, Nez Perce Tribe, Montana, CRITFC/Umatilla, NOAA, USFWS, COE BPA, BOR, Yakama Tribe, Washington and others participated in today's TMT conference call chaired by Doug Baus, COE, and facilitated by Donna Silverberg, DS Consulting.

2. Dworshak Operations

2a. Hourly Data. Alfredo Rodriguez, COE Walla Walla, reported. Current reservoir elevation is 1480 ft, with inflows of 12 kcfs over the past few days. Outflows have been temporarily reduced from 7 kcfs to 4.7 kcfs to facilitate a dive operation for annual inspection of the Clearwater Hatchery intake. The RO gates have been closed since 0700 hours today and will remain closed until 1700-1800 hours. At that time 7 kcfs spill will resume.

2b. NWRFC Water Supply Forecast North Fork Clearwater – Dworshak Dam. The current RFC 5-day QPF water supply forecast for April-July is 2.9 maf, not far from the Corps' official forecast of 3.2 maf issued at the beginning of April.

2c. Hourly TDG Data (tailrace, hatchery and Peck). When project outflows were reduced to 7 kcfs last week, TDG saturation levels went down from 110% to 107.5% in the tailwater, and from 100% to 99.7% in the hatchery. Total dissolved gas at the Peck gage is 102.5% saturation.

2d. NWRFC Dworshak Dam Inflow Forecast. The inflow forecast of 20-22 kcfs is due to forecasted warmer weather.

2e. NWRFC Climate Forecast. Over the next 6-10 days, temperatures in the Clearwater Basin have an equal chance of being either colder or warmer than normal, with no significant chance of precipitation. The 8-14 day forecast shows normal temperatures and equal chances of above or below normal precipitation. The 30-day forecast shows equal chances of above or below normal temperatures and below average precipitation. The 90-day forecast is showing warmer temperatures than normal, but below average precipitation. With temperatures warming at night and remaining above freezing, runoff can be expected soon.

2f. Snowpack Comparison Graphs and Proposed Operations. Snowpack readings at SNOTEL stations throughout the Clearwater Basin indicate that water year 2018 is shaping up to resemble 2011 most closely of the analog years used to model the operation. Snow Water Equivalent (SWE) at Hoodoo is tracking closest to 2012, while Lolo Pass SWE is higher than 2012 and closest to 2011. Lost Lake SWE is closest to 2011 of all the analog years. Crater Meadows SWE is higher than 2012 and closer to 2008 and 2011. The general trend in SNOTEL readings indicates that snowmelt and runoff is beginning and inflows will increase soon.

Based on the RFC's 10-day forecast, the planned operation is to continue Dworshak discharges at 7 kcfs through the end of April. Refill operations will begin on May 1 at midnight when discharges drop to full powerhouse of 4.8 kcfs with two small units. On May 10, discharges will drop to 2.4 kcfs using one small unit. Temperature concerns calling for augmentation flows to cool Lower Granite pool could arise as soon as mid-May.

Charles Morrill, Washington, asked about freezing level patterns in the Clearwater Basin, particularly whether the nighttime freeze/daytime thaw cycle is over, which makes inflow prediction difficult. The 10-day temperature forecast shows a warming trend with no significant freezing, Rodriguez replied. Temperatures downstream of Dworshak are expected to be warmer than in the past month. In the reservoir area, nighttime temperatures of 40-50 degrees F are expected. So the freeze/thaw cycle appears to be ending.

Until temperature management issues arise, the COE will not provide weekly updates on Dworshak operations unless requested. As for rehabilitation of unit 3, the official return to service date is still mid to late June. Erick Van Dyke, Oregon, requested an update in mid-May on SNOTEL readings in the basin.

3. Spring Spill

3a. Snake River TDG Overview Table. Dan Turner, COE, reported. The TDG table for all four lower Snake River projects shows spill caps, actual spill, TDG readings in the tailwater and next downstream forebay, gas cap exceedances (highlighted in blue), and the controlling gauge (the one closest to exceedance, marked in bold text).

In general, the downstream forebays are the controlling gages at Lower Granite, Little Goose and Lower Monumental. Ice Harbor is on minimum generation and has no exceedances in the tailwater or at the McNary downstream forebay. However, TDG readings in McNary forebay are creeping up primarily from Ice Harbor's TDG production.

In response to high TDG readings throughout the lower Snake River system, spill caps are being lowered. For example, yesterday the spill cap at Lower Granite was lowered from 42 to 39 kcfs. Many spill caps have been changed due to downstream forebay exceedances. With little wind, there has been little to no degassing between the tailwater and the downstream forebay.

In this first season of spill to the gas cap, the impacts of high TDG levels are accumulating in project forebays throughout the river system, Turner noted. High TDG levels are being passed from one project to another without the mixing effects of lower TDG from powerhouse flows, resulting in the need for reductions in project spill caps.

3b. Columbia River TDG Overview Table. A similar situation exists on the lower Columbia River, with downstream forebay TDG readings limiting spill and spill caps being lowered as a result.

The McNary gas cap was lowered when the controlling gauge switched from the tailwater to the downstream forebay at John Day. Operations at both John Day and The Dalles are constrained by downstream forebay TDG levels. Because Bonneville has no downstream forebay, the tailwater gauge controls the operation and the spill cap has been steady.

With an increasing inflow forecast, Turner estimated that involuntary spill will begin at some Snake River dams on April 27-29 and continue for 5-10 days. On the Columbia, he estimated that McNary would begin involuntary spill on April 29 and John Day on May 1. Bonneville and John Day will go to involuntary spill as soon as inflows increase. Involuntary spill will raise TDG levels throughout the system.

3c. Project Graphs. In general, there has been little wind since April 21 and not much degassing on the Snake. Many downstream forebays are exceeding 115% saturation.

At Lower Granite over the past few days, differences in TDG saturation readings in the tailwater and the next downstream forebay at Little Goose have been less than 1%. On a few occasions, downstream forebay TDG readings are exceeding those in the tailrace. Barometric pressure is expected to drop over the next 24 hours, which will raise TDG%.

The Little Goose tailrace gauge measures TDG levels of mixed flows from the powerhouse and spillway. As a result of high TDG levels coming into the project, downstream forebay TDG levels are reacting to upstream forebay TDG, and both are rising at the same rate with little or no degassing. Over the past few days, downstream forebay TDG readings have been consistently higher than tailrace readings.

The story on the Columbia River is similar. Many projects are receiving high TDG levels from upstream. At The Dalles, there's little difference between tailrace TDG readings and those in the downstream forebay at Bonneville. This situation is resulting in lowered spill caps throughout the system.

The 10-day weather forecast calls for steady barometric pressure and low wind speeds over the next 24 hours, followed by a change in barometric pressure that could cause up to 1.8% increase in TDG in the next downstream forebay. Winds, however, are forecasted to average 15 mph, which could lead to degassing and lower TDG over the next 10 days. After that, barometric pressure is forecasted to rise for the next 5 days, which would increase TDG.

Charles Morrill asked whether higher TDG readings correlate to late afternoons when temperatures rise. There haven't been a lot of daily swings, Turner said. Total dissolved gas is more reactive to barometric pressure and wind speed than temperature. Turner will keep an eye on whether TDG levels are rising in the daytime in relation to barometric pressure or temperature changes. TDG changes could also be related to fluctuating powerhouse flows.

Jay Hesse asked whether the 2% fluctuations in Peck gauge readings are related to daily temperature changes.

Erick Van Dyke asked how many tailwater TDG readings have exceeded state standards (of 120% TDG). Oregon's water quality standards are focused on tailwater readings. On the Snake, Turner said, there were none at Lower Granite, Little Goose, or Lower Monumental, and 4 at Ice Harbor. On the Columbia, there were none at McNary, John Day, or The Dalles, and 3 at Bonneville.

Van Dyke sought better scientific understanding of how forebay gas levels can be higher than tailwater levels. Apparently wind speed and barometric pressure are influencing the downstream forebays, with rapid changes equivalent to up to 3% variation in TDG saturation levels Turner said. This phenomenon is occurring mostly on the Snake, where travel times between projects are longer.

Trevor Conder, NOAA, asked for a write-up of this phenomenon to help pin down forebay TDG calculations. Tom Lorz, CRITFC, asked that the write-up be sent to all TMT members, and Turner said he would try to provide a summary prior to the next TMT meeting May 2.

4. Lower Monumental Operations

Turbulence in the tailrace at Lower Monumental is interfering with installing the bulkheads to start restoring Kaplan capability to Unit 6 which has been out of service since April 23 for this work, Ann Setter, COE, reported. Installing the bulkheads takes about 3 hours and will begin during the daily spill reduction for the fish barge transit in the tailrace, which typically takes about 2-3 hours. If more time is needed to finish installing the bulkheads after the fish barge operation, the project will resume spilling to the gas cap but with a modified spill pattern through bays 1-5 and close bays 6-8 to reduce tailrace turbulence.

Setter requested a poll of TMT members on whether they would approve a spill pattern change to close bays 6-8 today if necessary after the fish barge leaves and spill to the gas cap resumes. When the bulkheads are removed to bring Unit 6 back in service, currently anticipated on May 10, a similar operation may be needed. The bulkhead removal would dovetail with the daily spill modification for the fish barge transit in the tailrace.

Erick Van Dyke asked whether the spill pattern modification would mean increased passage through the powerhouse. Operations at Lower Monumental are being driven by spill to the gas cap, Setter said, and additional flow is passed through the turbines up to the maximum powerhouse flow of around 70 kcfs with Units 1 and 6 out of service and Units 2, 3, and 4 fixed-blade (non-adjustable). She pointed out that doing this work will provide a benefit from having another turbine at Lower Monumental that has adjustable Kaplan capability. The fixed-blade units result in “deadbands” at certain flow ranges, which limits the project’s ability to stay within MOP constraints when another unit is turned on at a fixed discharge during the daily spill reduction for the fish barge, Scott Bettin, BPA, said.

Trevor Conder asked whether an MOC will be submitted to FPOM that spells out the timing and spill pattern to be used after the barge passes. Setter said project staff would try to prepare one but time is limited. Conder asked, after the barge passes and the modified spill pattern continues for another hour, will the project go to gas cap spill or use fewer bays? After the barge leaves, the project will go to gas cap spill using a uniform pattern in bays 1-5, Setter replied.

TMT members were polled on the request to modify the spill pattern (spill in a uniform pattern through bays 1-5) while continuing the current gas cap spill operation (approximately 33 kcfs) this afternoon for a period up to 3 hours.

- **NOAA** – No objection. If the proposal means moving spill to the gas cap through bays 1-5 for 1-3 hours, no documentation is needed.
- **Washington** – No objection.
- **Oregon** – No objection, although there are concerns about impacts on fish.
- **Montana** – No objection.
- **Idaho** – No objection.
- **Nez Perce** – No objection.
- **Umatilla** – No objection.
- **BOR** – No objection.
- **BPA** – No objection.
- **USFWS** – No objection.

Given this consensus, the COE will proceed with bulkhead installation this afternoon during the spill reduction for the fish barge. If additional time is required, the spill pattern will be modified to close bays 6-8 until bulkhead installation is complete. There was agreement that, given time constraints, written documentation in the form of an MFR after the fact would be sufficient.

Next TMT Meeting
TMT will meet in person on May 2.

Name	***Affiliation***
Russ Kiefer	Idaho
Erick Van Dyke	Oregon
Jay Hesse	Nez Perce
Jim Litchfield	Montana
Tom Lorz	CRITFC/Umatilla
Trevor Conder	NOAA
Dave Swank	USFWS
Doug Baus	COE
Julie Ammann	COE
Tony Norris	BPA
Chris Runyan	BOR
Nancy Pionk	DSC
Ann Setter	COE Walla Walla
Mike O'Bryant	CBB
Ryan Laughery	COE
Tom Iverson	Yakama
Erick Hockersmith	COE
Ruth Burris	PGE
Paula Calvert	ODEQ
Alfredo Rodriguez	COE Walla Walla
Dan Turner	COE
Aaron Marshall	COE
Charles Morrill	Washington
Pat Vivian	note taker