DRAFT August 9, 2017

**FILE MEMORANDUM**

**FROM:** Gary Fredricks, NOAA Fisheries

**SUBJECT:** ERDC Trip Report – Bonneville and The Dalles Dam Gas Cap Spill Investigation, July 17 – 20, 2017.

**Participants:** COE Portland – Laurie Ebner, Amy Lynn, Steven Schlenker, Jeff Ament, Aaron Litzenberg and Jon Rerecich; COE ERDC PI – Don Wilson

**Purpose of the trip:** This was primarily the second week of a Corps work trip with an agency trip scheduled for September. I was present mainly because I was to attend a McNary Dam model trip the next week and our office only had travel money enough for one trip. Thus, I traveled a week early to get a preview of the Bonneville and The Dalles dam issues that others would be seeing during the planned September agency trip.

The primary purposes of the work were to assess issues that could occur at The Dalles and Bonneville dams under the court ordered gas cap spill in 2018. A secondary O&M add-on objective was to investigate minimum spill levels necessary to maintain acceptable outfall egress conditions for the Bonneville Dam Powerhouse Two Corner Collector (B2CC). This report addresses that last issue, only.

**Bonneville Dam Corner Collector**

**Methods:** The corner collector flow was simulated with a hose attached to a concrete block set in the model below Cascade Island. The spillway model does not include flow from either powerhouse so the angle of the hose release had to be set to simulate the push that would be provided by the second powerhouse flow. The standard dye release methods were used to assess egress conditions from the spillway and the improvised “corner collector”.

**Results Day One:**

Test 1. Spill = 50 kcfs, tailwater = 12’, standard FPP spill pattern. All dye released in and upstream of the B2CC flow moved downstream with no back eddy. Overall good egress.

Test 2. Spill = 50 kcfs, tailwater = 12’, spill pattern moved south to bays 13, 14, 15,16,17,18 with a 2’ opening in bay 1. Flow from the south spillbays crossed the entire spillway tailrace to push the B2CC flow downstream. Worked better than expected.

Test 3. Spill = 26 kcfs, tailwater = 12’, spill pattern used bays 16, 17, 18 (Bay 1 closed). Dye showed more reverse flow at the outfall of the B2CC and worse egress farther downstream. Bay 1 may be important to keeping better outfall conditions.

Test 4. Spill – 26 kcfs, tailwater =12’, pattern moved to bays 1, 2, 3. Spill actually crossed the tailrace well downstream. Very little benefit to B2CC. Most of the velocity was lost as the spill flow eddied downstream through the tailrace. Poor B2CC egress.

End of day 1. Test summary: Overall, 50 kcfs spill in both configurations worked ok to push B2CC flow downstream with little eddying and B2CC flow stayed off the Bradford Island shore. Of the 26 kcfs runs, the south pattern worked the best. Still, some B2CC flow moved upstream close to the B2CC outfall and there was some counterclockwise eddying farther out near the Bradford Island shore. Given this, most of the B2CC dye egressed downstream ok.

**Results Day Two:**

Test 1. Spill = 26 kcfs, TW = 12’, pattern = bays (opening) 1(2), 16(4), 17(4), 18(2). Dye releases looked ok. All downstream movement of B2CC flow, however there was some slow flow near the outfall.

Test 2. Spill =22 kcfs, TW = 12’, pattern = bays (opening) 1(2), 16(3), 17(3), 18(2). Looked similar to test 1, but a little more recirculation occurred near the outfall.

Test 3. Spill = 19.9 kcfs, TW = 12’, pattern = bays (opening) 1(2), 16(3), 17(2), 18(2). More recirculation of B2CC dye in mid spillway channel.

Test 4. Spill = 15.5 kcfs, TW = 12’, pattern = bays (opening) 16(3), 17(2), 18(2). Closed bay 1. Didn’t look good – too much recirculation of B2CC flow.

Test 5. Spill = 17.6 kcfs, TW = 12’, Pattern = bays (opening) 1(1), 16(3), 17(2), 18(2). One stop in bay 1. Looked fairly good, which surprised us. Good downstream flow from B2CC. Some recirculation of a portion of the B2CC flow upstream at about 250’ out from Bradford Island.

Test 6. Spill = 17.6 kcfs, TW = 12’, Pattern = bays (opening) 1(1), 16(2), 17(3), 18(2). Looked similar to test 5. Same flow recirculation near Bradford Island shore.

Test 7. Same condition as test 2. B2CC egress looked ok, some slight recirculation about 100’ from Bradford Island but overall B2CC egress looked ok.

Test 8. Same condition as test 2 with 15’ tailwater. Slightly more reverse B2CC egress flow just off the Bradford Island shore than at 12’ tailwater.

Test 9. Same condition as test 2 with a 10’ tailwater. Looked better with less recirculation of B2CC flow near the Bradford Island shore.

End of day two. Test summary: The 22 kcfs, four bay operation may be the best minimum spill operation. However, recognizing the uncertainties associated with the way the model was set up, the Corps will put together a trip report with the recommendation to test the first three test conditions in the prototype with dye, drogues and a drone for photo documentation.