

USACE WALLA WALLA DISTRICT BIOLOGICAL SERVICES: TEMPERATURE MONITORING PROGRAM AT MCNARY DAM

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		Report Period:	July 8 to 14, 2016
Report No.	MCN TEMP 16-7		

Fish Collection

An estimated 55,002 juvenile salmonids were collected, and 55,000 juvenile salmonids bypassed the McNary Juvenile Fish Facility (JFF; Table 1), comprising 99.98% subyearling Chinook salmon and 0.02% sockeye salmon. There were a total of 2 juvenile system mortalities, comprising 2 facility mortalities (Figure 1).

River Conditions

Average river flow for this reporting period was 158,900 cubic feet per second (158.9 kcfs), with an average spill of 79.6 kcfs.

Weather Conditions

The weekly average daytime temperature for July 7 to 14 was 72.8 °F. The weekly average nighttime temperature was 66.5 °F. Temperatures ranged from a maximum of 86.5 °F at 1900 on July 13 to a minimum of 58.9 °F at 0700 on July 11.

Winds averaged 1.8 miles per hour (mph) and were predominately from the north (Figure 2). The wind was highest at 1100 on July 7, with winds averaging 27 mph and gusts measuring up to 41 mph.

Probe Operations

Project operations began the sawtooth management plan on July 3 to mitigate warm water in the gatewells, collection channel, and JFF. During the week, some of the even numbered units were placed into standby mode to pull in colder water. Most of the odd numbered

units were operational. The number of operational units fluctuated during the week depending on needed operations.

Due to a miscommunication between personnel, a second issue with probe calibration was discovered. Some probes were not reset to zero before the recalibration performed on July 6. It was impossible to determine which probes were affected retroactively. All probes were collected between 0700 and 0800 on July 10 and brought to JFF for a second recalibration. The recalibration procedure was as described in last week's report and performed by one person. All steps in the process were documented for each probe and verified by two additional individuals.

After recalibration, the probes were tested in river water at JFF to verify consistent temperature measurements. Water temperature readings with a mercury thermometer during testing showed the water to be 66.5 °F. The average temperature recording of the 42 probes was 66.4 °F (± 0.24 °F). Maximum temperature recorded was 67.14 °F. The minimum recorded temperature was 66.06 °F. All probes were redeployed by 1600 on July 11. Temperature data for this report reflects data recorded after this time.

The Gatewell 2 probe and casing were ripped from the rigging after 0800 on July 12. The rigging line looked to be severed quickly and did not look frayed or worn. The probe at Recovery Raceway 9W was removed to replace the probe lost at Gatewell 2 at 1430 on July 14. The raceway probe will not be replaced.

The probe at Collection Channel 1 failed to record several data points on July 12 and may be failing. The probe from Collection Channel 8 was placed at Collection Channel 1 to provide monitoring coverage of the collection channel length. The probe from Collection Channel 1 was placed at Collection Channel 8. It will remain there until it fails to record temperature points.

A probe was moved from the barge dock to the JFF bypass outflow pipe. The probe was placed on the downstream side of the pipe approximately 10 feet from the water discharge site in 13 feet of water. The probe will be downloaded two times weekly.

Water Temperatures

Water temperatures were relatively uniform at the beginning of the reporting period, but became more dynamic during the reporting period (Figures 3 and 4). The average forebay

temperature (weekly average of 14 positions was 67.2°F) was higher than the average gatewell temperature (weekly average of 14 positions was 66.7°F; average of seven odd gatewell positions was 67.1 °F; average of seven even gatewell positions was 66.1°F). The JFF (weekly average of the separator, sample tank, and Recovery Raceway 9W was 67.0 °F) was the warmest location at the beginning of the reporting period, but remained relatively steady as the forebay and gatewell warmed in the latter part of the week. The collection channel had the lowest average temperatures (weekly average of positions at Units 1, 8, and 12 was 66.6 °F).

Water temperatures increased on days with sunshine and little to no wind. The temperature differential was highest across the forebay and across the gatewells on July 13 (Figure 5). The gatewells saw the largest average weekly temperature differential at 2.7 °F. The maximum gatewell temperature differential was 6.3 °F at 1900 on July 13. The average weekly temperature differential across 14 forebay positions was 1.8 °F. The maximum forebay temperature differential was 6.1 °F at 1500 on July 13 (F2 high; F7, F13, and F14 low).

The warmer waters had a smaller effect on differential temperatures through the dam (Figures 6 and 7). The average weekly temperature differential between the gatewells and forebay was 0.8 °F. In four units, the gatewell was warmer than the forebay on average (Units 1, 3, 5, and 9). In ten units, the forebay was warmer than the gatewell on average. The largest temperature differential was 6.3 °F at Unit 8 at 2100 to 2130 on July 13 (forebay greater than gatewell). The average weekly temperature differential between the gatewell and collection channel was 0.9 °F. The gatewell was warmer than the collection channel at Unit 1. The collection channel was warmer than the gatewell at Units 8 and 12. The largest temperature differential was 3.6 °F at Unit 12 at 2200 on June 13 (collection channel greater than gatewell).

The spillway temperatures followed the same trends seen in the powerhouse (Figure 8). Water temperatures remained consistent in the earlier portion of the week. Higher temperatures were recorded at the end of the week. Water temperatures were similar across the spillway and had a weekly average range of 66.1 °F to 66.9 °F..

Table 1
Bypass, Mortality, and River and Weather Conditions from 0700 July 7 to 0700 July 14

Date	Fish Collected	Fish Bypassed	Mortality		Avg. River Flow	Avg. Turbine Flow	Avg. Spill	Air Temperature		Wind Speed	
			Sample	Facility				Avg.	Max	Avg.	Max
Jul 7 – 8	19,301	19,300	0	1	185.0	87.7	92.6	71.5	83.0	2.9	27.0
Jul 8 – 9					181.7	86.0	91.0	67.6	78.3	0.9	6.0
July 9 – 10	11,900	11,900	0	0	160.9	75.5	80.7	68.8	80.3	1.2	6.0
Jul 10 – 11					128.0	59.2	64.1	66.2	74.2	2.9	10.0
Jul 11 – 12	13,150	13,150	0	0	142.3	66.2	71.3	70.9	81.1	1.4	7.0
Jul 12 – 13					153.2	71.8	76.7	70.2	81.2	2.4	11.0
Jul 13 – 14	10,651	10,650	0	1	161.2	75.7	80.8	71.0	86.5	0.5	2.0
Weekly Total	55,002	55,000	0	2	158.9	74.6	79.6	62.4		1.7	

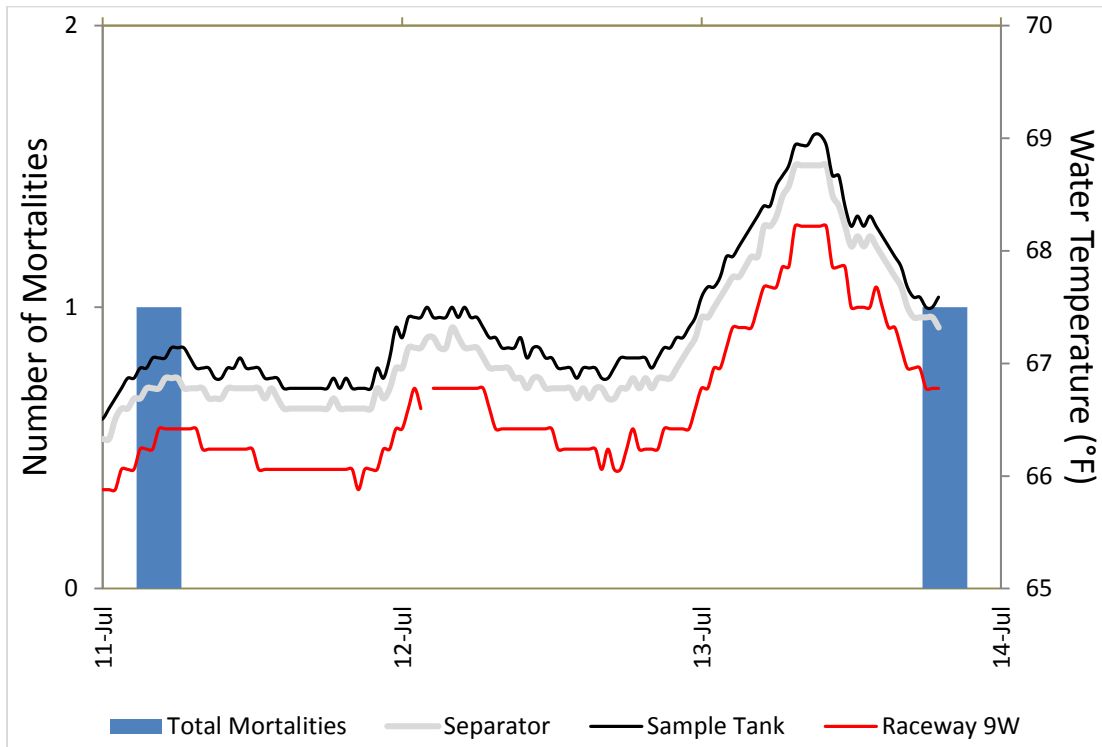


Figure 1
Juvenile Fish Facility Total System Mortalities and Three JFF Water Temperatures from 1100 July 11 to 0700 July 14 (Mortalities Reported as Time when Discovered)

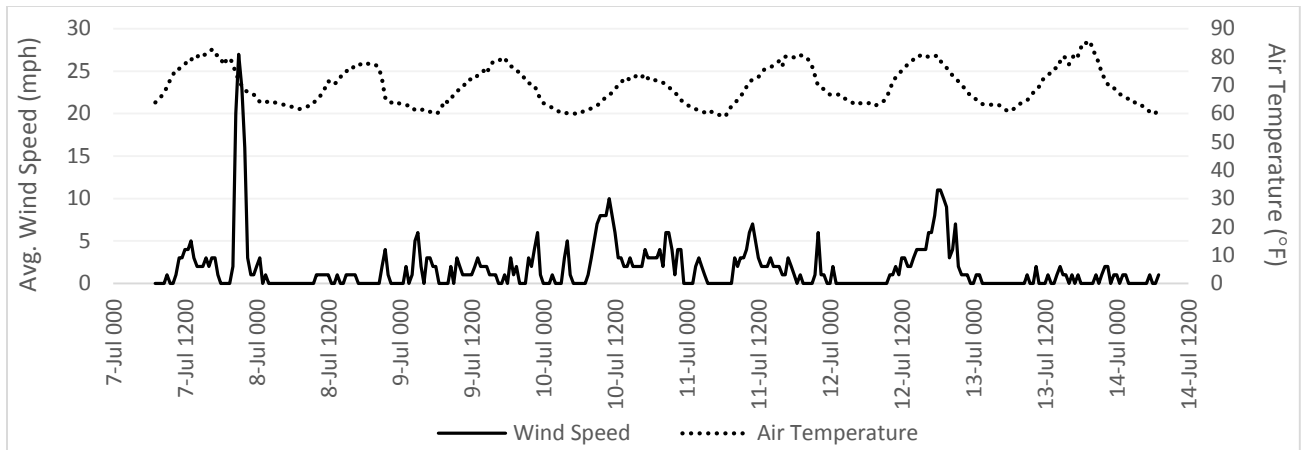


Figure 2
Average Wind Speed from 0700 July 7 to 0700 July 14

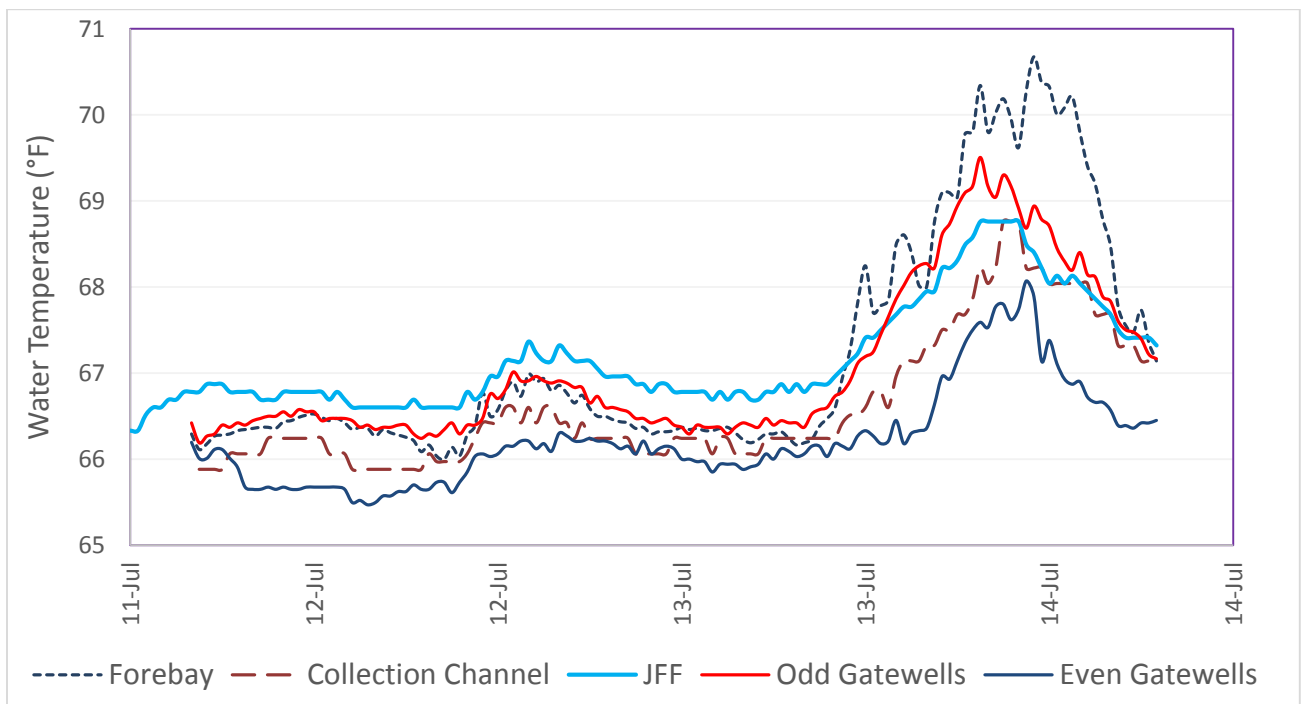


Figure 3
Average Water Temperatures for Four Dam Locations from 1100 July 11 to 0700 July 14. Even units were generally in standby mode unless needed for operational requirements

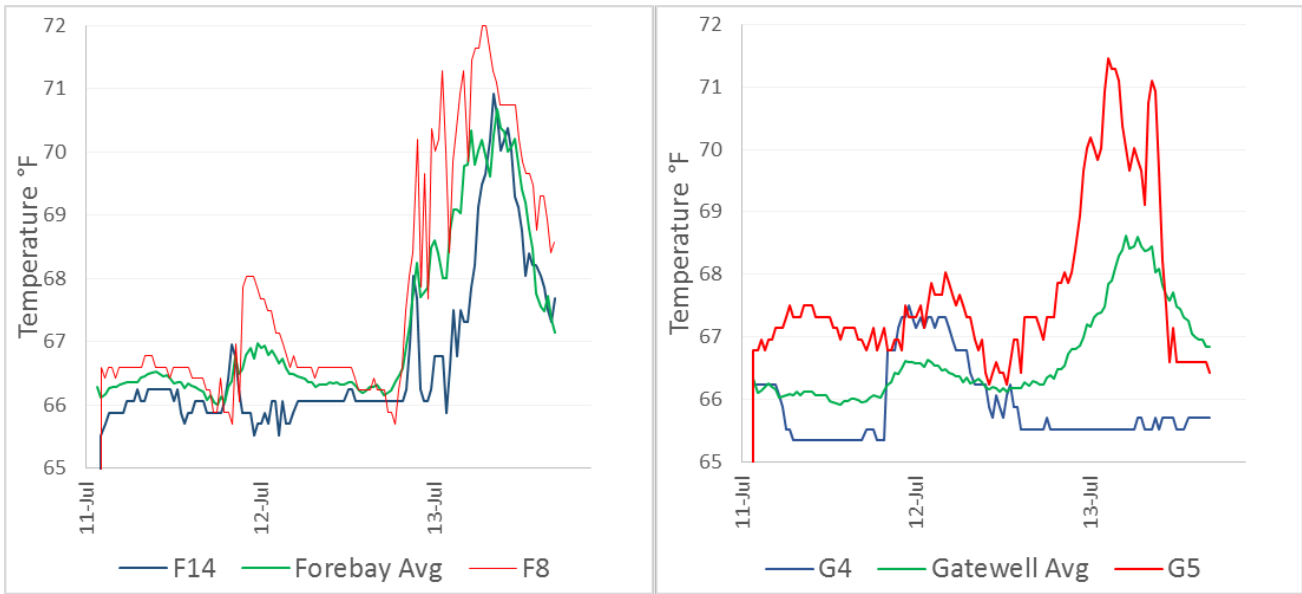


Figure 4
High, Average, and Low Forebay and Gatewell Temperatures from 1100 July 11 to 0700 July 14

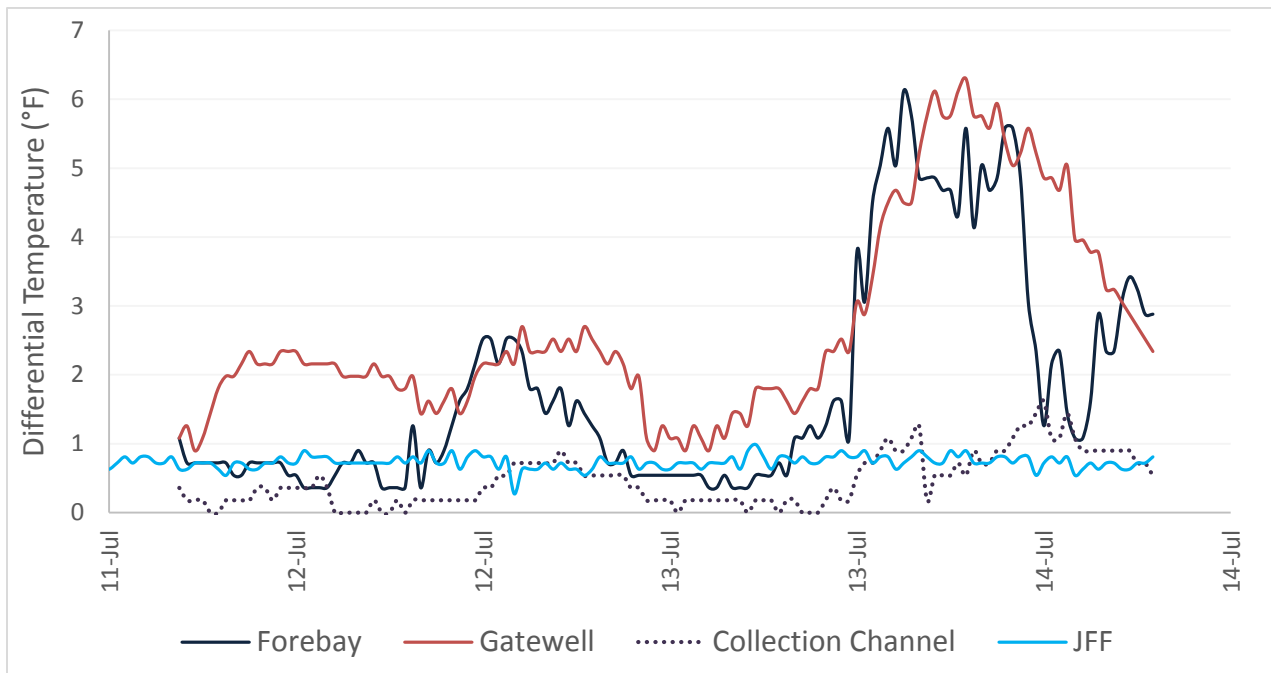


Figure 5
Average Differential Temperatures within Four Dam Locations from 1100 July 11 to 0700 July 14

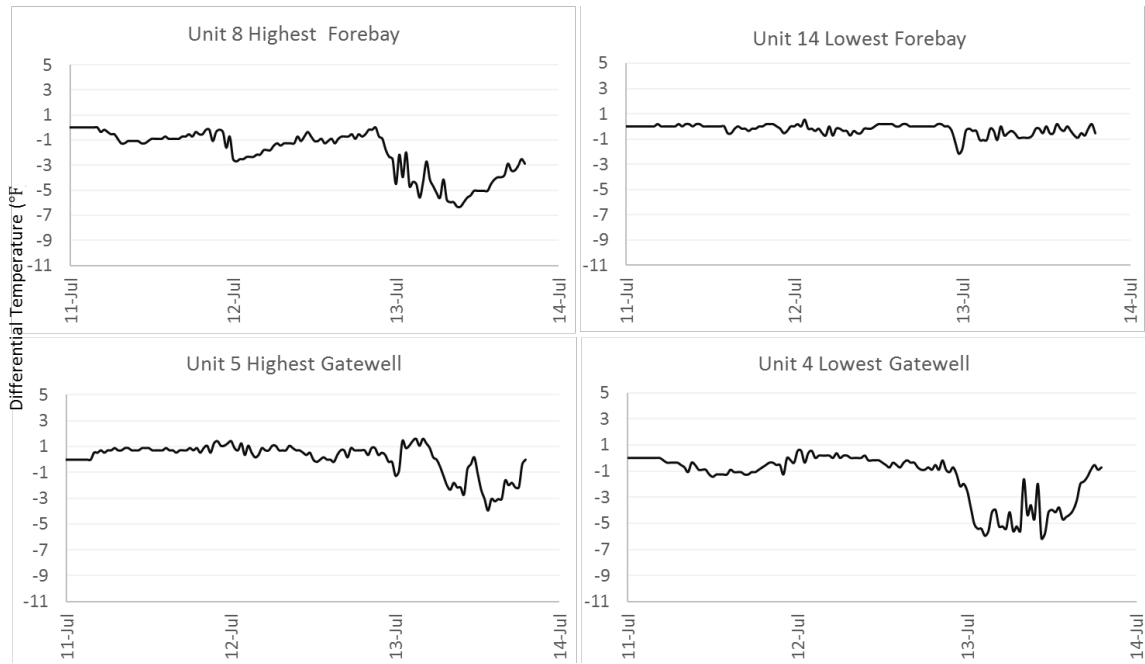


Figure 6
Gatewell and Forebay Differential Temperatures (Gatewell minus Forebay) for Units with the Highest and Lowest Weekly Average Temperature from 1100 July 11 to 0700 July 14

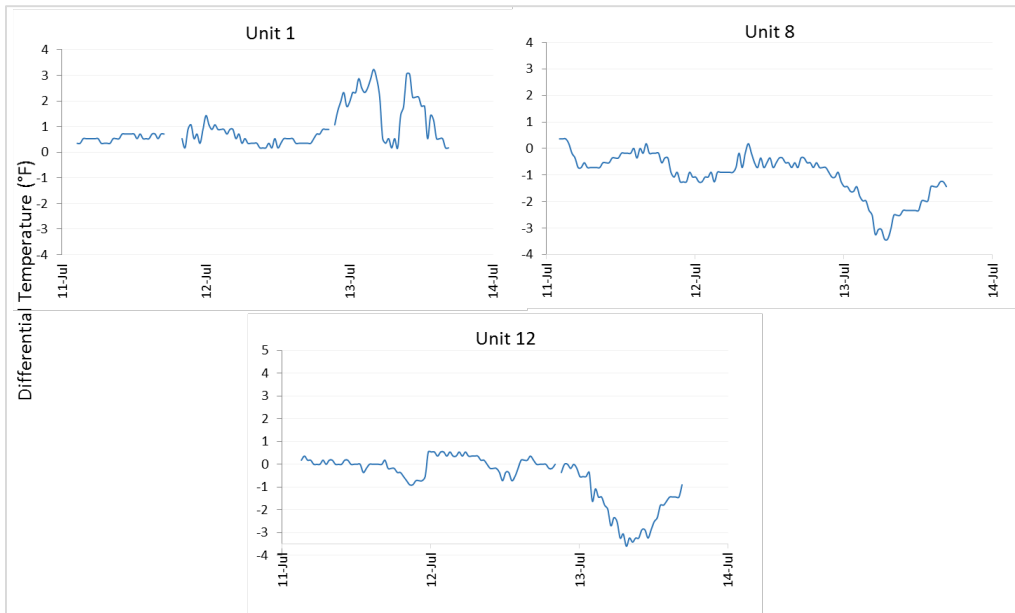


Figure 7
Gatewell and Collection Channel Differential Temperatures (Gatewell minus Collection Channel) for Units 1, 8, and 12 from 1100 July 11 to 0700 July 14

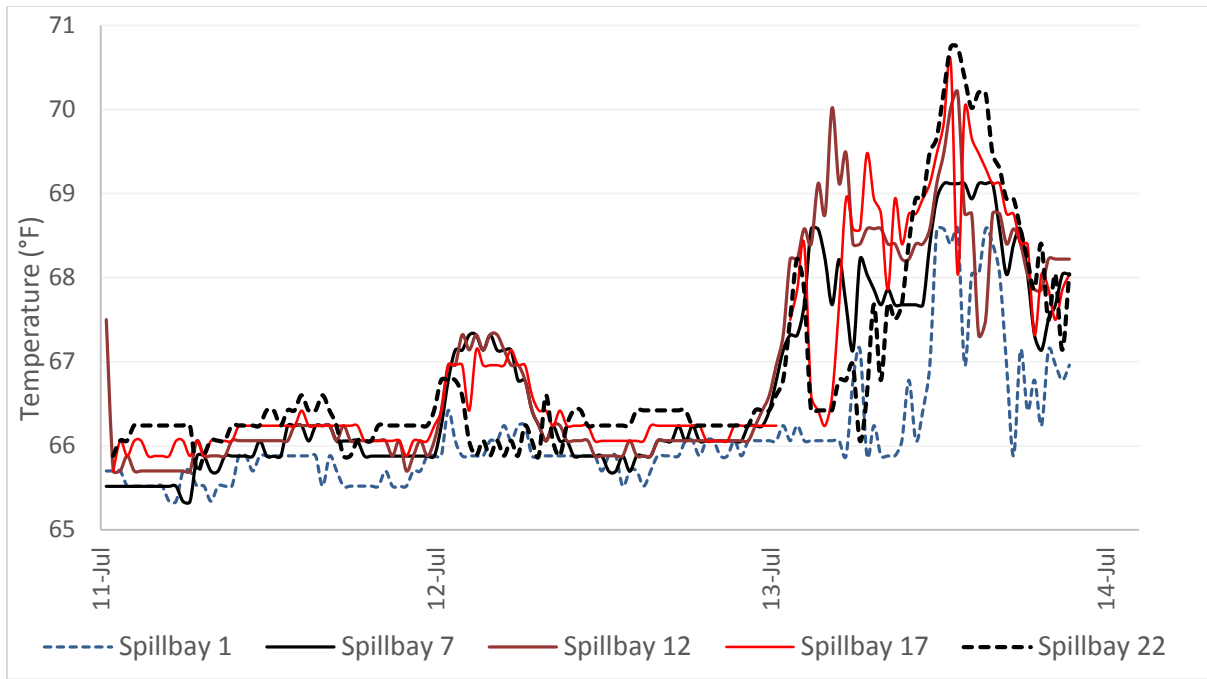


Figure 8
Temperatures for Five Spillbays from 1100 July 11 to 0700 July 14