# APPENDIX D

## DWORSHAK SPECIAL OPERATIONS

# DWORSHAK STORAGE VOLUMES

| | AVAILABLE $H_2O$ | GROSS STORAGE |
|---|---|---|
| ELEVATION | KSFD | KSFD |
| 1577 | 41.1 | 1543.1 |
| 1572 | 39.5 | 1502.0 |
| 1567 | 75.8 | 1462.5 |
| 1557 | 58.4 | 1386.7 |
| 1549 | 173.2 | 1328.3 |
| 1524 | 155.4 | 1155.1 |
| 1508.5 | 56 | 1055.7 |
| 1499 | 22.2 | 999.7 |
| 1495 | 108.4 | 977.5 |
| 1474 | 78.6 | 869.1 |
| 1457.6 | 39.9 | 790.5 |
| 1449 | 40.6 | 750.6 |
| 1440 | 65 | 710 |
| 1424 | 111 | 645 |
| 1400 | 34 | 534.0 |
| 1387 | 34 | 500.0* |
| 1375 | 66 | 466* |
| 1350 | 13 | 400* |
| 1345 | | 387* |

These storage volumes were taken from the Corps of Engineers, N.W. Division April 1998 Reservoir Storage Tables.
* They were plotted and extrapolated in Graph 1 to get storage volumes for elevations below 1400 feet.

## 2002 DWORSHAK TEMPERATURE PROFILES USED IN CALCULATIONS

| | | 5/8 | 6/3 | 7/17 | 8/1 | 8/8 | 8/28 | 9/10 | 9/27 | 10/2 | 10/7 | 10/16 | 11/13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gage ID | Elevation (ft) | Temp (F) | Temp (F) | Temp (F) | Temp (F) | Temp (F) | Temp (F) | Temp (F) | Temp (F) | Temp (F) | Temp (F) | Temp (F) | Temp (F) |
| T5 | 1574 | **49.5** | 67.2 | **58.6** | 74.2 | 71.0 | 70.9 | 60.1 | 59.9 | 54.2 | 55.3 | 46.6 | 46.2 |
| T6 | 1549 | 49.9 | **53.5** | 48.9 | **56.7** | 69.8 | 70.6 | 61.8 | 58.9 | 54.1 | 55.2 | 46.1 | 46.1 |
| T7 | 1524 | 50.3 | 44 | 45.6 | 49.8 | **52.3** | 67.0 | 61.2 | 58.7 | 54.3 | 55.3 | 46.5 | 46.6 |
| T8 | 1499 | 46.6 | 43.6 | 45.2 | 46.9 | 48.4 | **53.9** | 63.7 | 63.9 | 61.1 | 52.3 | 43.8 | 50.0 |
| T9 | 1474 | 42.5 | 43.1 | 44.5 | 44.4 | 45.7 | 47.2 | **51.9** | 58.2 | 61.3 | 58.2 | 54.1 | 50.3 |
| T10 | 1449 | 40.6 | 42.1 | 43.3 | 43.2 | 44.0 | 43.2 | 44.5 | **49.2** | **49.2** | **49.7** | **46.8** | **49.7** |
| T11 | 1424 | 40.2 | 41.4 | 40.0 | 42.7 | 43.3 | **41.2** | **40.8** | **45.2** | **45.2** | **44.4** | **42.9** | **45.3** |
| T12 | 1399 | 40.1 | 40.2 | 41.3 | 41.9 | 42.5 | 40.7 | 39.8 | 43.6 | 43.2 | 43.1 | 40.3 | 44.0 |
| T13 | 1374 | 39.4 | 39.6 | 40.6 | 40.7 | 41.3 | 38.9 | 41.8 | 42.8 | 43.1 | 41.9 | 38.6 | 42.9 |
| T14 | 1349 | **39.2** | **39.3** | **39.8** | **39.8** | **39.7** | 37.9 | 40.3 | 41.4 | 41.7 | 41.0 | 35.7 | 41.4 |
| T15 | 1324 | 39.0 | 39 | 39.3 | 38.9 | 39.1 | 37.3 | 39.5 | 40.0 | 40.2 | 39.8 | 39.7 | 40.3 |
| T16 | 1299 | 38.3 | 38.1 | 37.9 | 37.9 | 38.1 | 36.0 | 38.4 | 39.0 | 39.0 | 38.7 | 38.2 | 39.2 |
| T17 | 1249 | 38.3 | 38 | 37.7 | 36.3 | 37.8 | 35.5 | 38.1 | 38.6 | 38.6 | 38.1 | 37.9 | 38.8 |
| T18 | 1199 | 37.8 | 37.7 | 37.1 | 35.9 | 37.4 | 35.3 | 38.6 | 38.1 | 38.0 | 38.7 | 37.5 | 38.2 |
| T19 | 1149 | 38.4 | 38.2 | 38.2 | 36.5 | 38.1 | 36.7 | 37.3 | 38.7 | 38.6 | 37.9 | 37.3 | 38.8 |
| T20 | 1099 | 37.5 | 37.4 | 35.1 | 35.7 | 37.2 | 35.1 | 36.5 | 37.9 | 37.8 | 37.9 | 37.9 | 38.0 |
| T21 | 1049 | 39.1 | 38.9 | 36.6 | 37.0 | 38.6 | 36.4 | 38.0 | 39.2 | 39.1 | 38.2 | 38.5 | 39.2 |

Blue= highest available cold water  Purple = lowest available cold water

RO removes water from the 1350 ft elevation

Units 1,2 & 3 removes water from 1435 ft in undershot mode and 1610 ft In overshot mode

## MASS BALANCE OF RESERVOIR FOR TEMPERATURE CONTROL

| OUTLETS | Possible | Actual | Total Flow Amt | % of | Outflow | Weighted Contributions |
|---|---|---|---|---|---|---|
| | Elevation | Elevation- ft | KCFS or KSFD | Total Flow | Temperature | To total Temp. |
| RO 1,2,3 | 1350 | 1350 | 3.9 | 0.28 | 42 | 11.9 |
| Selector Gate 1& 2 | 1565 - 1390 | 1524 | 4.9 | 0.36 | 50 | 17.8 |
| Selector Gate 3 | 1565 - 1390 | 1524 | 5 | 0.36 | 50 | 18.1 |
| Daily Averages | | | 13.8 | 1.0 | | 47.7 |
| Weekly average | | | 96.6 | | | |

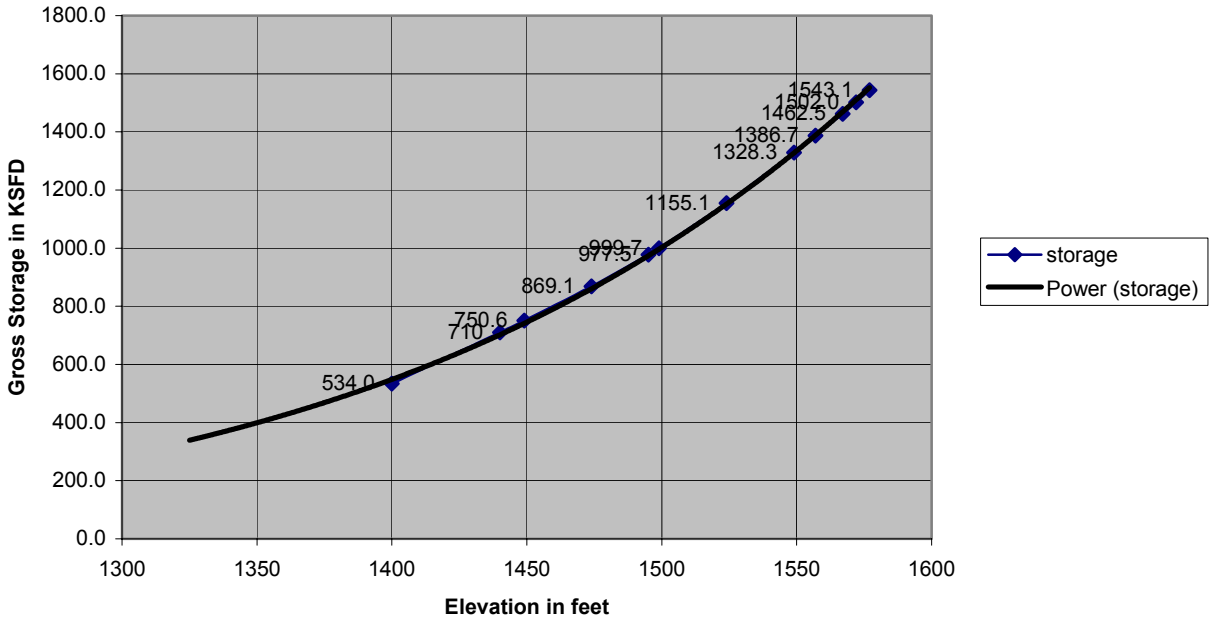
**LENGTH OF TIME WE CAN MAINTAIN 45$^{O}$ F TEMPERATURE WATER W/13.8 KCFS FLOWS**

| WATERS USED IN TEMPERATURE CONTROL EFFORT | H20 Used in 1 week | Total H20 Available for effort (KSFD) | Elevations water is taken from | # Weeks we can maintain 45 degrees T |
|---|---|---|---|---|
| Water taken from 1508-1457.6 ft | 69.3 | 264.7 | 1508-1457.6 | 3.8 |
| Water taken from 1380.6-1457 ft | 0 | 183.0 | 1380.6-1457 ft | Used to address Temp change over time. |
| Water taken from 1380.6-1350 ft | 27.3 | 118 | 1380.6-1350 ft | 4.3 |

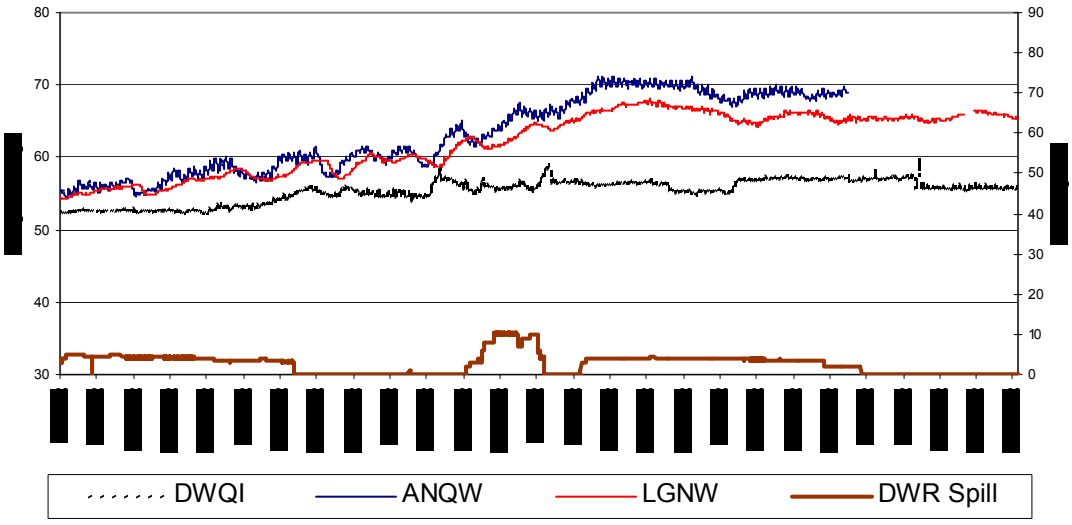
**LENGTH OF TIME WE CAN MAINTAIN 48$^{O}$ F TEMPERATURE WATER W/13.8 KCFS FLOWS**

| WATERS USED IN TEMP CONTROL EFFORT IN AUG | H20 Used in 1 week | Total H20 Available for effort (KSFD) | Elevations water is taken from | # Weeks we can maintain 48 degrees T |
|---|---|---|---|---|
| Water taken from 1508-1457.6 ft | 69.3 | 445.1 | 1508-1457.6 | 6.4 |
| Water taken from 1380.6-1457 ft | 0 | 210.0 | 1380.6-1457 ft | Used to address Temp change over time. |
| Water taken from 1380.6-1350 ft | 27.3 | 167 | 1380.6-1350 ft | 6.1 |

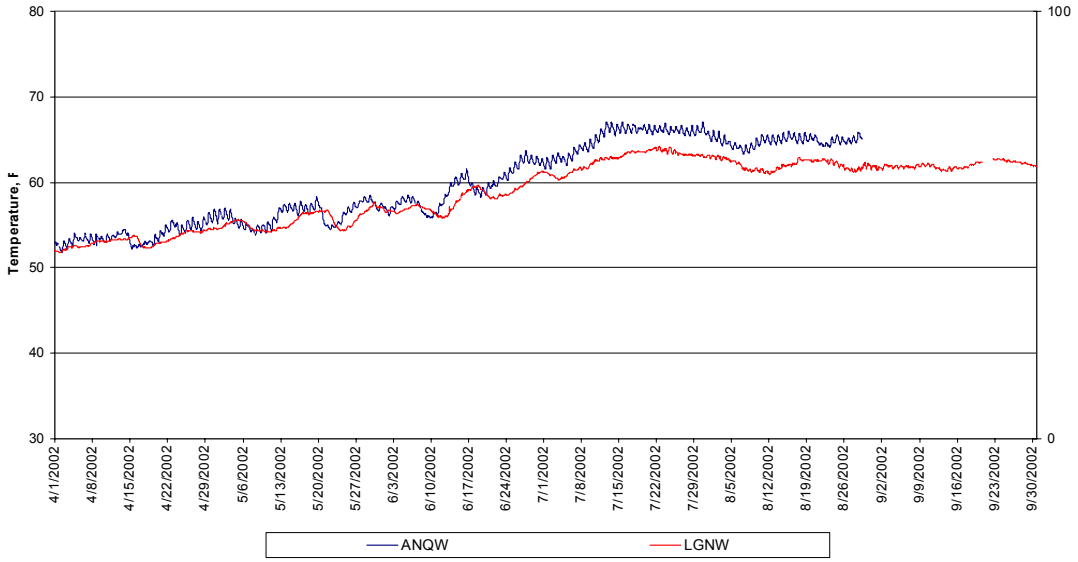
**Dworshak Forebay Storage Volumes**



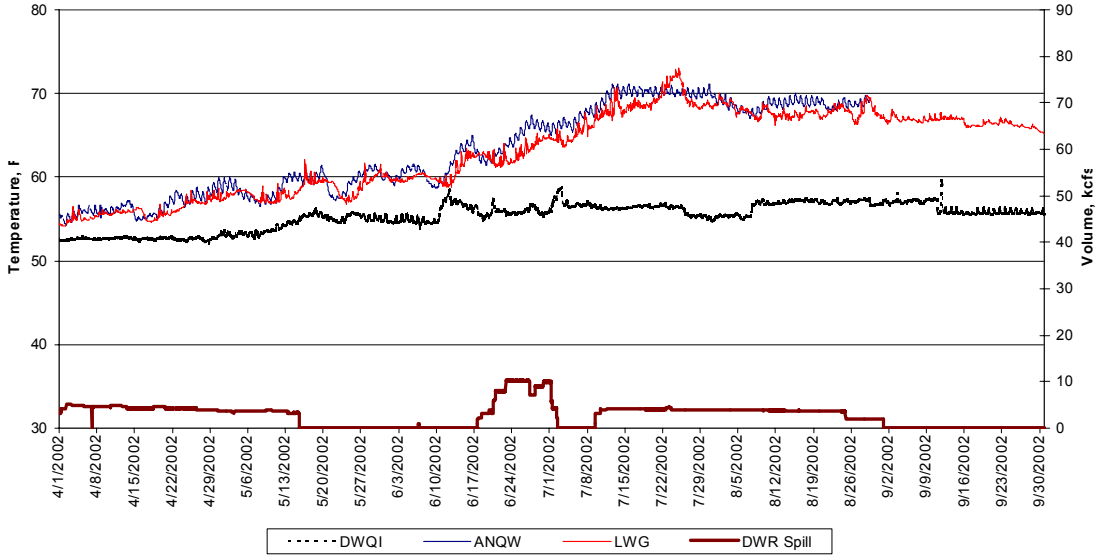

**Dworshak, Anatone and Lower Granite Tailwater Hourly Temperature**
**1 Apr - 30 Sep, 2002**

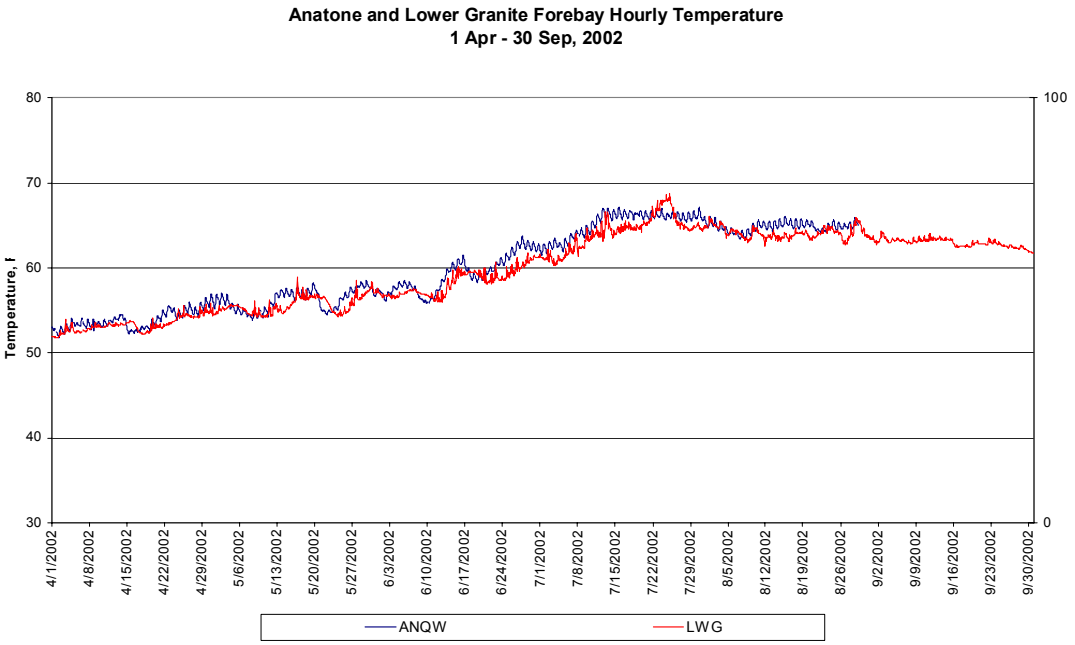


**Anatone and Lower Granite Tailwater Hourly Temperature**
**1 Apr - 30 Sep, 2002**




**Dworshak, Anatone and Lower Granite Forebay Hourly Temperature**
**1 Apr - 30 Sep, 2002**





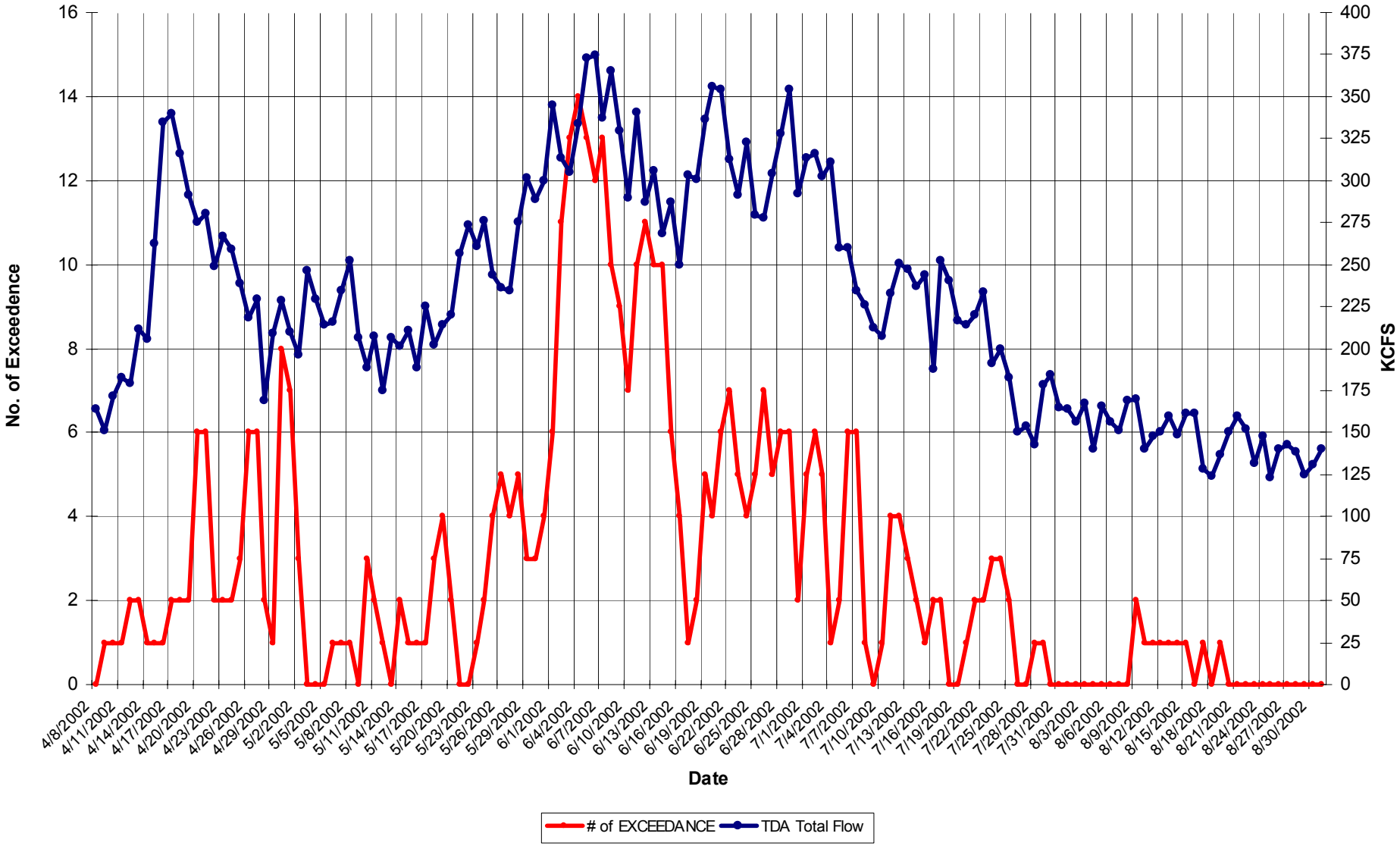

# DWORSHAK EXCEEDANCES

**During 2002 Spill Season**
**(April 15 – August 31)**

In or Before
2000 Exceedances were not tabulated

2001 Exceedance for 2 hours out of a total of 3,312 hours in spill season. (0 hours spill occurred)
2 hours/3312 hours = 0.0006
Exceeding State TDG standard 0.06% of the time spilled
**In compliance 99.94 % of the time spilled**

2002 Exceedance for 262 hours out of a total of 3,312 hours in spill season. (2684 hours spill occurred)
262 hours/3312 hours = 0.08
Exceeding State TDG standard 8% of the time spilled
**In compliance 92 % of the time spilled**

# Average Number of TDG EXCEEDANCES During 2002 Spill Season

(April 8 – August 31)