

**Appendix F.** Vertical hydraulic head gradient data between adjacent monitoring zones for boreholes USGS 103, USGS 105, USGS 108, USGS 132, USGS 133, USGS 134, USGS 135, MIDDLE 2050A, and MIDDLE 2051, Idaho National Laboratory, Idaho, June 2010 and September 2010 for USGS 108.

[**Local name** is the local well identifier used in this study. **Zone No.** is the identifiers used to locate monitoring zones. **Port No.** is the identifiers used to locate measurement ports. **Depth interval** limits in feet below land surface (ft bls). **Hydraulic head** values in feet above National Geodetic Vertical Datum of 1929 (NGVD29); difference in feet (ft), and vertical gradient in in feet per foot (ft/ft). Vertical gradients are calculated over a 3.0 ft thick inflated packer bladder]

| Local name | Zone No. | Port No. | Depth interval  |              | Hydraulic head |          |                 |                  |
|------------|----------|----------|-----------------|--------------|----------------|----------|-----------------|------------------|
|            |          |          | Bottom (ft bls) | Top (ft bls) | Bottom (ft)    | Top (ft) | Difference (ft) | Gradient (ft/ft) |
| USGS 103   | 1, 2     | 1, 2     | 1,257.4         | 1,254.4      | 4,420.2        | 4,420.2  | 0.0             | 0.0              |
|            | 2, 3     | 2–4      | 1,242.9         | 1,239.9      | 4,420.2        | 4,420.2  | 0.0             | 0.0              |
|            | 3, 4     | 3–5      | 1,184.4         | 1,181.4      | 4,420.2        | 4,420.1  | 0.1             | 0.0              |
|            | 4, 5     | 5, 6     | 1,115.2         | 1,112.2      | 4,420.1        | 4,420.2  | -0.1            | -0.0             |
|            | 5, 6     | 6–8      | 1,100.6         | 1,097.6      | 4,420.2        | 4,420.1  | 0.0             | 0.0              |
|            | 6, 7     | 7–9      | 1,063.2         | 1,060.2      | 4,420.1        | 4,420.2  | -0.0            | -0.0             |
|            | 7, 8     | 9, 10    | 1,045.5         | 1,042.5      | 4,420.2        | 4,420.1  | 0.0             | 0.0              |
|            | 8, 9     | 10–12    | 1,016.5         | 1,013.5      | 4,420.1        | 4,420.3  | -0.1            | -0.0             |
|            | 9, 10    | 11–13    | 958.0           | 955.0        | 4,420.3        | 4,420.1  | 0.1             | 0.0              |
|            | 10, 11   | 13, 14   | 948.4           | 945.4        | 4,420.1        | 4,420.2  | -0.1            | -0.0             |
|            | 11, 12   | 14–16    | 922.6           | 919.6        | 4,420.2        | 4,420.2  | -0.1            | -0.0             |
|            | 12, 13   | 15–17    | 891.6           | 888.6        | 4,420.2        | 4,420.2  | 0.1             | 0.0              |
|            | 13, 14   | 17, 18   | 862.6           | 859.6        | 4,420.2        | 4,420.3  | -0.1            | -0.0             |
|            | 14, 15   | 18–20    | 835.1           | 832.1        | 4,420.3        | 4,420.3  | 0.0             | 0.0              |
|            | 15, 16   | 19–21    | 766.9           | 763.9        | 4,420.3        | 4,420.7  | -0.4            | -0.1             |
|            | 16, 17   | 21–23    | 694.3           | 691.3        | 4,420.7        | 4,420.3  | 0.3             | 0.1              |
|            | USGS 105 | 1, 2     | 1–3             | 1,279.2      | 1,276.2        | 4,419.9  | 4,419.9         | -0.0             |
| 2, 3       |          | 2–4      | 1,224.8         | 1,221.8      | 4,419.9        | 4,419.9  | 0.0             | 0.0              |
| 3, 4       |          | 4, 5     | 1,165.9         | 1,162.9      | 4,419.9        | 4,419.8  | 0.0             | 0.0              |
| 4, 5       |          | 5–7      | 1,105.5         | 1,102.5      | 4,419.8        | 4,419.8  | -0.0            | -0.0             |
| 5, 6       |          | 6–8      | 1,034.6         | 1,031.6      | 4,419.8        | 4,419.8  | 0.0             | 0.0              |
| 6, 7       |          | 8, 9     | 1,005.1         | 1,002.1      | 4,419.8        | 4,419.8  | 0.0             | 0.0              |
| 7, 8       |          | 9–11     | 985.4           | 982.4        | 4,419.8        | 4,419.8  | 0.0             | 0.0              |
| 8, 9       |          | 10–12    | 929.3           | 926.3        | 4,419.8        | 4,419.8  | -0.0            | -0.0             |
| 9, 10      |          | 12, 13   | 909.6           | 906.6        | 4,419.8        | 4,419.8  | -0.0            | -0.0             |
| 10, 11     |          | 13–15    | 865.3           | 862.3        | 4,419.8        | 4,419.7  | 0.2             | 0.1              |
| 11, 12     |          | 14–16    | 830.4           | 827.4        | 4,419.7        | 4,419.6  | 0.1             | 0.0              |
| 12, 13     |          | 16–18    | 754.9           | 751.9        | 4,419.6        | 4,419.5  | 0.1             | 0.0              |
| USGS 108   |          | 1, 2     | 1–3             | 1,160.9      | 1,157.9        | 4,419.3  | 4,419.3         | -0.0             |
|            | 2, 3     | 3, 4     | 1,121.6         | 1,118.6      | 4,419.3        | 4,419.5  | -0.2            | -0.1             |
|            | 3, 4     | 4–6      | 1,062.6         | 1,059.6      | 4,419.5        | 4,419.5  | -0.0            | -0.0             |
|            | 4, 5     | 5–7      | 1,018.0         | 1,015.0      | 4,419.5        | 4,419.5  | 0.0             | 0.0              |
|            | 5, 6     | 7, 8     | 980.4           | 977.4        | 4,419.5        | 4,419.5  | -0.1            | -0.0             |
|            | 6, 7     | 8–10     | 906.7           | 903.7        | 4,419.5        | 4,419.3  | 0.3             | 0.1              |
|            | 7, 8     | 9–11     | 872.0           | 869.0        | 4,419.3        | 4,419.2  | 0.1             | 0.0              |
|            | 8, 9     | 11–13    | 832.7           | 829.7        | 4,419.2        | 4,419.1  | 0.1             | 0.0              |
|            | 9, 10    | 12–14    | 791.4           | 788.4        | 4,419.1        | 4,418.8  | 0.3             | 0.1              |
|            | 10, 11   | 14–16    | 681.8           | 678.8        | 4,418.8        | 4,418.7  | 0.1             | 0.0              |

**F2    Multilevel Groundwater Monitoring of Hydraulic Head and Temperature, Eastern Snake River Plain Aquifer, Idaho, 2009–10**

**Appendix F.** Vertical hydraulic head gradient data between adjacent monitoring zones for boreholes USGS 103, USGS 105, USGS 108, USGS 132, USGS 133, USGS 134, USGS 135, MIDDLE 2050A, and MIDDLE 2051, Idaho National Laboratory, Idaho, June 2010 and September 2010 for USGS 108.—Continued

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| Local name | Zone No. | Port No. | Depth interval  |              | Hydraulic head |          |                 |                  |
|------------|----------|----------|-----------------|--------------|----------------|----------|-----------------|------------------|
|            |          |          | Bottom (ft bls) | Top (ft bls) | Bottom (ft)    | Top (ft) | Difference (ft) | Gradient (ft/ft) |
| USGS 132   | 1, 2     | 1–3      | 1,152.3         | 1,149.3      | 4,420.2        | 4,420.2  | 0.0             | 0.0              |
|            | 2, 3     | 3, 4     | 1,144.1         | 1,141.1      | 4,420.2        | 4,420.1  | 0.0             | 0.0              |
|            | 3, 4     | 4, 5     | 1,134.3         | 1,131.3      | 4,420.1        | 4,420.0  | 0.1             | 0.0              |
|            | 4, 5     | 5–7      | 1,046.1         | 1,043.1      | 4,420.0        | 4,420.0  | 0.0             | 0.0              |
|            | 5, 6     | 6–8      | 984.3           | 981.3        | 4,420.0        | 4,420.1  | -0.0            | -0.0             |
|            | 6, 7     | 8, 9     | 953.2           | 950.2        | 4,420.1        | 4,420.1  | -0.0            | -0.0             |
|            | 7, 8     | 9–11     | 938.4           | 935.4        | 4,420.1        | 4,420.0  | 0.0             | 0.0              |
|            | 8, 9     | 10–12    | 911.1           | 908.1        | 4,420.0        | 4,420.0  | 0.1             | 0.0              |
|            | 9, 10    | 12, 13   | 876.7           | 873.7        | 4,420.0        | 4,420.0  | -0.0            | -0.0             |
|            | 10, 11   | 13–15    | 866.8           | 863.8        | 4,420.0        | 4,420.0  | -0.0            | -0.0             |
|            | 11, 12   | 14–16    | 811.5           | 808.5        | 4,420.0        | 4,420.0  | -0.0            | -0.0             |
|            | 12, 13   | 16, 17   | 801.6           | 798.6        | 4,420.0        | 4,420.0  | -0.0            | -0.0             |
|            | 13, 14   | 17–19    | 790.1           | 787.1        | 4,420.0        | 4,420.0  | 0.0             | 0.0              |
|            | 14, 15   | 18–20    | 726.6           | 723.6        | 4,420.0        | 4,419.9  | 0.1             | 0.0              |
|            | 15, 16   | 20, 21   | 672.5           | 669.5        | 4,419.9        | 4,419.9  | -0.0            | -0.0             |
|            | 16, 17   | 21–23    | 662.6           | 659.6        | 4,419.9        | 4,419.9  | 0.0             | 0.0              |
|            | USGS 133 | 1, 2     | 1–3             | 724.8        | 721.8          | 4,457.1  | 4,457.0         | 0.1              |
| 2, 3       |          | 3, 4     | 715.0           | 712.0        | 4,457.0        | 4,457.0  | -0.0            | -0.0             |
| 3, 4       |          | 4, 5     | 698.6           | 695.6        | 4,457.0        | 4,457.1  | -0.1            | -0.0             |
| 4, 5       |          | 5, 6     | 685.5           | 682.5        | 4,457.1        | 4,461.9  | -4.8            | -1.6             |
| 5, 6       |          | 6, 7     | 618.2           | 615.2        | 4,461.8        | 4,462.4  | -0.6            | -0.2             |
| 6, 7       |          | 7–9      | 593.7           | 590.7        | 4,462.4        | 4,463.2  | -0.8            | -0.3             |
| 7, 8       |          | 8–10     | 555.5           | 552.5        | 4,463.2        | 4,463.1  | 0.0             | 0.0              |
| 8, 9       |          | 10, 11   | 539.1           | 536.1        | 4,463.1        | 4,463.2  | -0.0            | -0.0             |
| 9, 10      |          | 11–13    | 483.2           | 480.2        | 4,463.2        | 4,463.0  | 0.1             | 0.0              |
| USGS 134   |          | 1, 2     | 1, 2            | 881.0        | 878.0          | 4,453.5  | 4,453.5         | -0.1             |
|            | 2, 3     | 2–4      | 871.0           | 868.0        | 4,453.5        | 4,453.5  | 0.0             | 0.0              |
|            | 3, 4     | 3–5      | 846.0           | 843.0        | 4,453.5        | 4,453.5  | 0.0             | 0.0              |
|            | 4, 5     | 5, 6     | 831.0           | 828.0        | 4,453.5        | 4,453.5  | -0.0            | -0.0             |
|            | 5, 6     | 6–8      | 821.0           | 818.0        | 4,453.5        | 4,453.5  | 0.1             | 0.0              |
|            | 6, 7     | 7–9      | 782.0           | 779.0        | 4,453.5        | 4,453.5  | -0.0            | -0.0             |
|            | 7, 8     | 9, 10    | 747.0           | 744.0        | 4,453.5        | 4,453.5  | -0.0            | -0.0             |
|            | 8, 9     | 10–12    | 723.0           | 720.0        | 4,453.5        | 4,453.7  | -0.1            | -0.0             |
|            | 9, 10    | 11–13    | 690.9           | 687.9        | 4,453.7        | 4,454.4  | -0.7            | -0.2             |
|            | 10, 11   | 13, 14   | 664.9           | 661.9        | 4,454.4        | 4,453.6  | 0.8             | 0.3              |
|            | 11, 12   | 14–16    | 654.9           | 651.9        | 4,453.6        | 4,453.7  | -0.0            | -0.0             |
|            | 12, 13   | 15–17    | 638.9           | 635.9        | 4,453.7        | 4,453.7  | -0.1            | -0.0             |
|            | 13, 14   | 17, 18   | 604.8           | 601.8        | 4,453.7        | 4,453.7  | -0.0            | -0.0             |
|            | 14, 15   | 18–20    | 592.8           | 589.8        | 4,453.7        | 4,453.9  | -0.2            | -0.1             |

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| Local name   | Zone No. | Port No. | Depth interval  |              | Hydraulic head |          |                 |                  |
|--------------|----------|----------|-----------------|--------------|----------------|----------|-----------------|------------------|
|              |          |          | Bottom (ft bls) | Top (ft bls) | Bottom (ft)    | Top (ft) | Difference (ft) | Gradient (ft/ft) |
| USGS 135     | 1, 2     | 1–3      | 1,105.6         | 1,102.6      | 4,419.0        | 4,417.5  | 1.5             | 0.5              |
|              | 2, 3     | 3, 4     | 1,054.8         | 1,051.8      | 4,417.5        | 4,417.5  | 0.0             | 0.0              |
|              | 3, 4     | 4–6      | 1,010.6         | 1,007.6      | 4,417.5        | 4,417.5  | -0.0            | -0.0             |
|              | 4, 5     | 5–7      | 967.5           | 964.5        | 4,417.5        | 4,417.5  | 0.0             | 0.0              |
|              | 5, 6     | 7, 8     | 923.3           | 920.3        | 4,417.5        | 4,417.5  | -0.0            | -0.0             |
|              | 6, 7     | 8–10     | 864.2           | 861.2        | 4,417.5        | 4,417.6  | -0.1            | -0.0             |
|              | 7, 8     | 9–11     | 822.6           | 819.6        | 4,417.6        | 4,417.5  | 0.1             | 0.0              |
|              | 8, 9     | 11, 12   | 790.0           | 787.0        | 4,417.5        | 4,417.4  | 0.0             | 0.0              |
|              | 9, 10    | 12–14    | 765.3           | 762.3        | 4,417.4        | 4,417.5  | -0.0            | -0.0             |
| MIDDLE 2050A | 1, 2     | 1, 2     | 1,267.5         | 1,264.5      | 4,445.8        | 4,446.2  | -0.4            | -0.1             |
|              | 2, 3     | 2, 3     | 1,229.7         | 1,226.7      | 4,446.2        | 4,446.2  | -0.1            | -0.0             |
|              | 3, 4     | 3, 4     | 1,179.7         | 1,176.7      | 4,446.2        | 4,446.3  | -0.0            | -0.0             |
|              | 4, 5     | 4, 5     | 1,081.3         | 1,078.3      | 4,446.3        | 4,446.4  | -0.1            | -0.0             |
|              | 5, 6     | 5, 6     | 1,043.6         | 1,040.6      | 4,446.4        | 4,446.4  | -0.0            | -0.0             |
|              | 6, 7     | 6, 7     | 998.7           | 995.7        | 4,446.4        | 4,446.4  | 0.0             | 0.0              |
|              | 7, 8     | 7, 8     | 843.1           | 840.1        | 4,446.4        | 4,446.5  | -0.1            | -0.0             |
|              | 8, 9     | 8, 9     | 810.4           | 807.4        | 4,446.5        | 4,446.4  | 0.1             | 0.0              |
|              | 9, 10    | 9, 10    | 790.0           | 787.0        | 4,446.4        | 4,446.4  | 0.0             | 0.0              |
|              | 10, 11   | 10, 11   | 719.5           | 716.5        | 4,446.4        | 4,446.5  | -0.1            | -0.0             |
|              | 11, 12   | 11, 12   | 706.4           | 703.4        | 4,446.5        | 4,446.8  | -0.4            | -0.1             |
|              | 12, 13   | 12, 13   | 643.3           | 640.3        | 4,446.8        | 4,446.8  | -0.0            | -0.0             |
|              | 13, 14   | 13, 14   | 623.7           | 620.7        | 4,446.8        | 4,446.8  | 0.0             | 0.0              |
|              | 14, 15   | 14, 15   | 541.6           | 538.6        | 4,446.8        | 4,446.9  | -0.0            | -0.0             |
| MIDDLE 2051  | 1, 2     | 1, 2     | 1,140.3         | 1,137.3      | 4,430.0        | 4,430.0  | 0.0             | 0.0              |
|              | 2, 3     | 2, 3     | 1,130.5         | 1,127.5      | 4,430.0        | 4,430.0  | 0.0             | 0.0              |
|              | 3, 4     | 3, 4     | 1,090.5         | 1,087.5      | 4,430.0        | 4,429.9  | 0.0             | 0.0              |
|              | 4, 5     | 4, 5     | 1,002.2         | 999.2        | 4,429.9        | 4,426.7  | 3.3             | 1.1              |
|              | 5, 6     | 5, 6     | 879.4           | 876.4        | 4,426.7        | 4,426.6  | 0.0             | 0.0              |
|              | 6, 7     | 6, 7     | 826.2           | 823.2        | 4,426.6        | 4,426.6  | 0.0             | 0.0              |
|              | 7, 8     | 7, 8     | 791.9           | 788.9        | 4,426.6        | 4,426.7  | -0.0            | -0.0             |
|              | 8, 9     | 8, 9     | 773.8           | 770.8        | 4,426.7        | 4,426.7  | -0.0            | -0.0             |
|              | 9, 10    | 9, 10    | 748.4           | 745.4        | 4,426.7        | 4,426.7  | -0.1            | -0.0             |
|              | 10, 11   | 10, 11   | 646.7           | 643.7        | 4,426.7        | 4,433.0  | -6.3            | -2.1             |
|              | 11, 12   | 11, 12   | 612.2           | 609.2        | 4,433.0        | 4,433.8  | -0.8            | -0.3             |

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