

Introduction

Monmouth and Ocean Counties lie in east central New Jersey within the New Jersey Coastal Plain (NJCP). These two large counties, with a combined population of approximately 1.2 million people, use approximately 6.5 billion gallons of water per year, of which about 85 percent is for drinking water (figs. 2a and 2b). Of the 6.5 billion gallons used, more than 50 percent is groundwater and the rest is surface water. Surface water is more heavily used in Monmouth County where nearly 20 billion gallons per year of surface water and only 10 billion gallons per year of groundwater are used (New Jersey Geological and Water Survey, 2011).

With increased population growth, the need for additional water supply, and the replacement of existing wells have led to the drilling of new groundwater-supply wells, providing new insights into the subsurface geology and aquifers of Monmouth and Ocean Counties. Consequently, a new study of the deep confined aquifers beneath the New Jersey Coastal Plain in Monmouth and Ocean Counties was initiated to improve our understanding of the thickness and extent of these aquifers. Previous hydrogeologic investigations and frameworks for this area were developed by Jablonksi (1980) for Monmouth County and Anderson and Appel

(1989) for Ocean County, and Zapceca (1989) for the entire NJCP. In this study, the primary focus is on the major confined aquifers including the Atlantic City 800-foot sand (Ocean County only), Piney Point aquifer, Vincentown aquifer, Wenonah-Mount Laurel aquifer, Englishtown aquifer system, Magoghy aquifer, and Kirkwood-Cohansey aquifer system (fig. 3). Improvements in our understanding of these and other confined aquifers (for example, the Vincentown aquifer in Monmouth County, the aquifer is restricted to a narrow 10-mile belt extending from Long Branch southwest to New Egypt, in Ocean County; withdrawal of water of surface water from New Egypt to Bennetts Mills and yields of domestic wells are less than 50 gallons per minute (Anderson and Appel, 1989).

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Vincentown aquifer – is limited within its outcrop area to approximately 10 miles down-drain, where it grades into a clay-silt confining bed. It supplies domestic and some industrial and public-supply water. The Piney Point aquifer is a thick, massive, medium-to-coarse sand and gravel, and contains minor amounts of glauconitic sand and shells. Its thickness is variable and reaches a maximum of 140 feet near Long Branch (Zapceca, 1989, well 29-01921 on fig. 1). It is a more productive aquifer in Ocean County (for example, the Vincentown aquifer in Monmouth County, the aquifer is restricted to a narrow 10-mile belt extending from Long Branch southwest to New Egypt, in Ocean County; withdrawal of water of surface water from New Egypt to Bennetts Mills and yields of domestic wells are less than 50 gallons per minute (Anderson and Appel, 1989).

Red Bank Sand aquifer – is a very minor aquifer in Monmouth County that supplies domestic wells with water. Yields from these wells range from 2 to 25 gallons per minute (Jablonksi, 1980). The Red Bank Sand aquifer consists of the Sheshebury Member of the Red Bank Formation, and is a medium-to-coarse sand. This sand pinches out approximately 5 miles from its outcrop (section D-D').

Wenonah-Mount Laurel aquifer – is located to the southeast of its outcrop belt and mainly consists of slightly glauconitic medium sands of the Mount Laurel Formation and the fine sands of the Wenonah Formation (Nemickas, 1976). Its thickness is variable and commonly ranges from 30 to 80 feet. Where the sands are thin and located primarily in the upper part of the Mount Laurel Formation, nearly 100 feet separate the Wenonah-Mount Laurel aquifer and Englishtown aquifer system. Where the aquifer sands are thicker and more extensive, separation between the Wenonah-Mount Laurel and the upper Englishtown aquifer is more limited. The aquifer is a productive aquifer in Ocean County (for example, the Wenonah-Mount Laurel aquifer in Monmouth County, the aquifer is restricted to a narrow 10-mile belt extending from Long Branch southwest to New Egypt, in Ocean County; withdrawal of water of surface water from New Egypt to Bennetts Mills and yields of domestic wells are less than 50 gallons per minute (Anderson and Appel, 1989).

Englishtown aquifer system – is a single aquifer in upland areas of Monmouth County. It is a thick, continuous aquifer in Monmouth County, and two distinct aquifers separated by a clay-silt confining bed (Nichols, 1977) in down-drain areas in northeastern Ocean County (for example, the Englishtown aquifer system in Ocean County, the aquifer is restricted to a narrow 10-mile belt extending from Long Branch southwest to New Egypt, in Ocean County; withdrawal of water of surface water from New Egypt to Bennetts Mills and yields of domestic wells are less than 50 gallons per minute (Anderson and Appel, 1989).

Magoghy aquifer – consists of fine-to-coarse sand interstratified with dark, carbonaceous clay. It is a thick, continuous aquifer in Monmouth County, and two distinct aquifers separated by a clay-silt confining bed (Nichols, 1977) in down-drain areas in northeastern Ocean County (for example, the Magoghy aquifer in Monmouth County, the aquifer is restricted to a narrow 10-mile belt extending from Long Branch southwest to New Egypt, in Ocean County; withdrawal of water of surface water from New Egypt to Bennetts Mills and yields of domestic wells are less than 50 gallons per minute (Anderson and Appel, 1989).

Kirkwood-Cohansey aquifer system – consists of varied geologic units depending on location, including parts of the Miocene Kirkwood and Cohansey Formations, and younger surficial aquifers. It consists of fine-to-coarse sand, locally silty, with sparse gravel lenses, and thin-to-thick intervals of clay-silt in places. It generally behaves as a water table aquifer, although locally it may be semi-confined. It is an excellent aquifer in parts of Ocean County where it reaches a maximum thickness of approximately 400 feet at Island Beach.

Rio Grande water-bearing zone – is a thin, confined aquifer in southern Ocean County. It reaches a maximum thickness of 70 feet at well 33-15626 (fig. 1), and is within the confining unit overlying the 800-foot sand and underlying the Kirkwood-Cohansey aquifer system, and usually within the Wildwood confining unit of the Kirkwood Formation. It is typically gray sand with some interbedded silt and clay (Sugarmann, 2001).

Atlantic City 800-foot sand – is a major confined aquifer supplying water to southern Ocean County, primarily along the barrier islands where it reaches a maximum thickness of approximately 200 feet. It consists of sands from the Lower and Shiloh Marl members of the Kirkwood Formation (Sugarmann, 2001). In places the 800-foot sand aquifer cannot be separated from the underlying Kirkwood-Cohansey aquifer system (for example in well 33-01031) and is included within the Kirkwood-Cohansey aquifer system. The aquifer is generally a gray, massive medium-to-coarse quartz sand with shelly beds and sparse thin interbeds of clay. Less common beds of pebbly coarse sand, clayey sand, and fine-to-medium sand may be interbedded with silty clay.

Piney Point aquifer – is a middle Ocean confined aquifer (Nemickas and Carswell, 1976) that is correlative with the Toms River Member of the Shark River Formation (Browning and others, 2011). The aquifer is coarser at the top, consisting of glauconitic coarse to very coarse sand, and finer down section to granular medium-to-coarse sand. Gravelous occur throughout these sands. The aquifer is restricted to Ocean County in the study area, where it is an excellent aquifer in the Toms River area.

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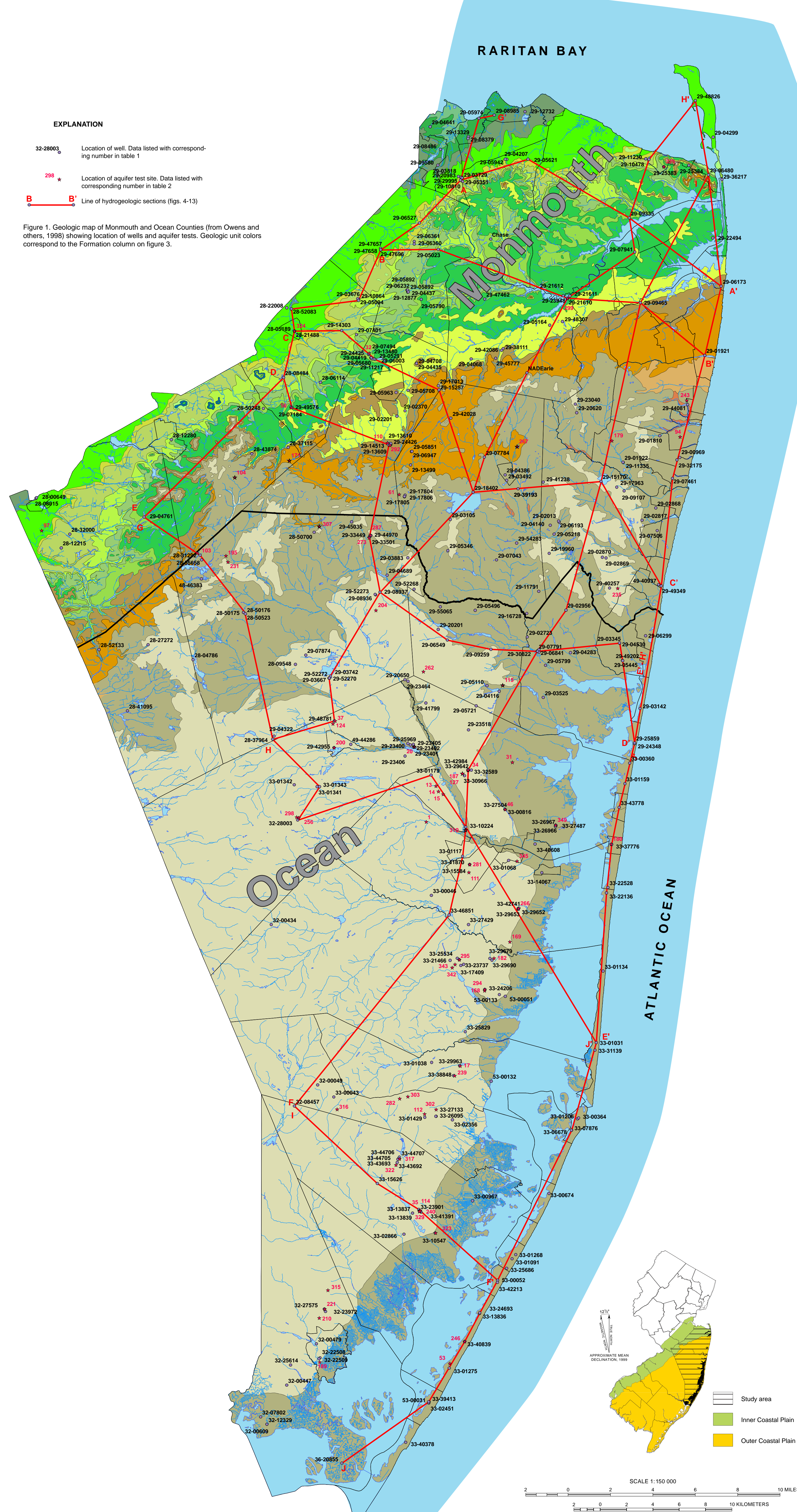


Figure 1. Geologic map of Monmouth and Ocean Counties, New Jersey, showing location of wells and aquifer tests. Geologic unit colors correspond to the Formation column on figure 3.

| NJ Permit | County | Municipality | Quadrangle Name | Latitude (ddmmss) | Longitude (ddmmss) | Total Depth (ft) | Elevation (ft) |
|-----------|----------|---------------------------|---------------------|-------------------|--------------------|------------------|----------------|
| 28-03524 | Monmouth | Altamont Boro | Altamont NJ | 40-1053 | 74-3824 | 305 | 72 |
| 28-04788 | Ocean | Jackson Twp | Cassville NJ | 40-0414 | 74-2023 | 401 | 133 |
| 28-05189 | Monmouth | Englishtown Boro | Freehold NJ | 40-1743 | 74-2136 | 690 | 68 |
| 28-06114 | Monmouth | Manalapan Twp | Freehold NJ | 40-1528 | 74-2011 | 569 | 135 |
| 28-06152 | Monmouth | Manalapan Twp | Freehold NJ | 40-1551 | 74-2212 | 710 | 95 |
| 28-09548 | Ocean | Jackson Twp | Altamont NJ | 40-1052 | 74-3826 | 465 | 68 |
| 28-12215 | Monmouth | Union Beach Boro | Lakehurst NJ | 40-0402 | 74-2134 | 555 | 128 |
| 28-12215 | Monmouth | Upper Freehold Twp | Altamont NJ | 40-0408 | 74-3405 | 385 | 87 |
| 28-20280 | Monmouth | Roseville Boro | Roseville NJ | 40-1316 | 74-2251 | 585 | 162 |
| 28-28148 | Monmouth | Englishtown Boro | Freehold NJ | 40-1743 | 74-2136 | 700 | 68 |
| 28-28176 | Monmouth | Manalapan Twp | Freehold NJ | 40-1840 | 74-2200 | 680 | 63 |
| 28-27272 | Ocean | Plumsted Twp | Cassville NJ | 40-0451 | 74-2026 | 238 | 144 |
| 28-31292 | Ocean | Jackson Twp | Roseville NJ | 40-0831 | 74-2039 | 909 | 130 |
| 28-32008 | Monmouth | Upper Freehold Twp | Altamont NJ | 40-0923 | 74-2337 | 360 | 97 |
| 28-37115 | Monmouth | Milstone Twp | Adelphi NJ | 40-1256 | 74-2156 | 250 | 172 |
| 28-37864 | Ocean | Manchester Twp | Cassville NJ | 40-0558 | 74-2247 | 1651 | 94 |
| 28-41095 | Ocean | Plumsted Twp | New Egypt NJ | 40-0208 | 74-3302 | 240 | 88 |
| 28-43874 | Monmouth | Milstone Twp | Roseville NJ | 40-1241 | 74-2352 | 435 | 242 |
| 28-50175 | Ocean | Jackson Twp | Cassville NJ | 40-0810 | 74-2420 | 740 | 148 |
| 28-50176 | Ocean | Jackson Twp | Cassville NJ | 40-0807 | 74-2414 | 750 | 142 |
| 28-50248 | Monmouth | Milstone Twp | Roseville NJ | 40-1243 | 74-2351 | 435 | 171 |
| 28-50523 | Ocean | Jackson Twp | Cassville NJ | 40-0810 | 74-2420 | 740 | 148 |
| 28-50700 | Ocean | Jackson Twp | Adelphi NJ | 40-0927 | 74-2033 | 740 | 149 |
| 28-50748 | Monmouth | Manalapan Twp | Freehold NJ | 40-1528 | 74-2015 | 569 | 135 |
| 28-50858 | Ocean | Plumsted Twp | New Egypt NJ | 40-0208 | 74-3302 | 240 | 88 |
| 28-50969 | Monmouth | Bradley Beach Boro | Asbury Park NJ | 40-1222 | 74-0107 | 456 | 16 |
| 28-51140 | Monmouth | Nepune Twp | Asbury Park NJ | 40-1212 | 74-0097 | 867 | 29 |
| 28-51292 | Monmouth | Long Branch East NJ | Long Branch East NJ | 40-1220 | 74-0100 | 1040 | 15 |
| 28-51922 | Monmouth | Nepune Twp | Asbury Park NJ | 40-1217 | 74-0040 | 1071 | 35 |
| 28-52013 | Monmouth | Vail Twp | Asbury Park NJ | 40-0883 | 74-0729 | 520 | 80 |
| 28-52220 | Monmouth | Freehold Twp | Adelphi NJ | 40-1212 | 74-2157 | 247 | 129 |
| 28-52370 | Monmouth | Vail Twp | Adelphi NJ | 40-1246 | 74-1737 | 750 | 121 |
| 28-52723 | Monmouth | Howell Twp | Lakewood NJ | 40-0555 | 74-0851 | 740 | 9 |
| 28-52844 | Monmouth | Howell Twp | Asbury Park NJ | 40-0605 | 74-0905 | 645 | 64 |
| 28-52868 | Monmouth | Vail Twp | Asbury Park NJ | 40-1024 | 74-0216 | 688 | 30 |
| 28-52869 | Monmouth | Howell Twp | Asbury Park NJ | 40-0822 | 74-0457 | 744 | 110 |
| 28-53172 | Monmouth | Howell Twp | Asbury Park NJ | 40-0624 | 74-0282 | 728 | 92 |
| 28-53256 | Ocean | Brick Twp | Point Pleasant NJ | 40-0614 | 74-0706 | 1145 | 21 |
| 28-53305 | Monmouth | Howell Twp | Farmingdale NJ | 40-0958 | 74-0316 | 609 | 164 |
| 28-53442 | Monmouth | Milstone Twp | Point Pleasant NJ | 40-0311 | 74-0153 | 1603 | 31 |
| 28-53445 | Monmouth | Point Pleasant Boro | Point Pleasant NJ | 40-0452 | 74-0415 | 1411 | 16 |
| 28-53492 | Monmouth | Farmingdale Boro | Farmingdale NJ | 40-1134 | 74-0104 | 888 | 74 |
| 28-53507 | Ocean | Brick Twp | Point Pleasant NJ | 40-0628 | 74-0139 | 793 | 11 |
| 28-53667 | Ocean | Jackson Twp | Lakehurst NJ | 40-0328 | 74-1944 | 1782 | 103 |
| 28-53676 | Monmouth | Manalapan Twp | Freehold NJ | 40-1002 | 74-1811 | 957 | 151 |
| 28-53680 | Monmouth | Manalapan Twp | Freehold NJ | 40-1238 | 74-1934 | 773 | 104 |
| 28-53742 | Ocean | Jackson Twp | Lakehurst NJ | 40-0333 | 74-1941 | 1619 | 108 |
| 28-53818 | Monmouth | Milstone Boro | Keyport NJ-NY | 40-0402 | 74-0249 | 375 | 73 |
| 28-53903 | Monmouth | Asbury Park Boro | Asbury Park NJ | 40-1034 | 74-0139 | 635 | 116 |
| 28-54013 | Monmouth | Cole Neck Twp | Marlboro NJ | 40-1633 | 74-1207 | 675 | 102 |
| 28-54116 | Ocean | Lakewood Twp | Lakewood NJ | 40-0255 | 74-1011 | 938 | 40 |
| 28-54169 | Monmouth | Howell Twp | Point Pleasant NJ | 40-0645 | 74-0165 | 716 | 66 |
| 28-54207 | Monmouth | Howell Twp | Keyport NJ-NY | 40-0444 | 74-0105 | 716 | 72 |
| 28-54289 | Ocean | Brick Twp | Point Pleasant NJ | 40-0429 | 74-0652 | 951 | 23 |
| 28-54369 | Monmouth | Manalapan Twp | Sandy Hook Neck NJ | 40-0508 | 74-0412 | 440 | 12 |
| 28-54322 | Ocean | Jackson Twp | Cassville NJ | 40-1016 | 74-2242 | 1736 | 93 |
| 28-54386 | Monmouth | Farmingdale Boro | Farmingdale NJ | 40-1147 | 74-0120 | 582 | 74 |
| 28-54389 | Monmouth | Freehold Twp | Freehold NJ | 40-1836 | 74-1729 | 745 | 79 |
| 28-54435 | Monmouth | Freehold Twp | Freehold NJ | 40-1823 | 74-1602 | 389 | 202 |
| 28-54437 | Monmouth | Marlboro Twp | Freehold NJ | 40-1819 | 74-1528 | 168 | 133 |
| 28-54530 | Ocean | Point Pleasant Boro | Point Pleasant NJ | 40-0453 | 74-0415 | 984 | 16 |
| 28-54547 | Monmouth | Keyport Boro | Keyport NJ-NY | 40-1416 | 74-0058 | 685 | 64 |
| 28-54689 | Ocean | Jackson Twp | Adelphi NJ | 40-1241 | 74-1839 | 562 | 92 |
| 28-54708 | Monmouth | Freehold Twp | Freehold NJ | 40-1822 | 74-1503 | 682 | 198 |
| 28-54767 | Monmouth | Upper Freehold Twp | Roseville NJ | 40-1205 | 74-2251 | 585 | 162 |
| 28-55023 | Monmouth | Marlboro Twp | Marlboro NJ | 40-1203 | 74-1352 | 874 | 147 |
| 28-55094 | Monmouth | Manalapan Twp | Freehold NJ | 40-1801 | 74-1808 | 815 | 137 |
| 28-55110 | Monmouth | Marlboro Twp | Point Pleasant NJ | 40-1309 | 74-0137 | 617 | 44 |
| 28-55168 | Monmouth | Marlboro Twp | Marlboro NJ | 40-1206 | 74-0810 | 600 | 81 |
| 28-55216 | Monmouth | Vail Twp | Farmingdale NJ | 40-0921 | 74-0743 | 1006 | 34 |
| 28-55243 | Monmouth | Freehold Twp | Freehold NJ | 40-1836 | 74-1528 | 168 | 133 |
| 28-55346 | Monmouth | Howell Twp | Farmingdale NJ | 40-0842 | 74-1322 | 500 | 136 |
| 28-55381 | Monmouth | Milstone Boro | Keyport NJ-NY | 40-0250 | 74-1232 | 450 | 85 |
| 28-55404 | Ocean | Point Pleasant Boro | Point Pleasant NJ | 40-0459 | 74-0415 | 1657 | 205 |
| 28-55496 | Ocean | Lakewood Twp | Lakewood NJ | 40-0614 | 74-1157 | 823 | 61 |
| 28-55621 | Monmouth | Holmdel Twp | Keyport NJ-NY | 40-0444 | 74-0902 | 799 | 66 |
| 28-55623 | Monmouth | Freehold Twp | Freehold NJ | 40-1735 | 74-1538 | 645 | 129 |
| 28-55708 | Monmouth | Freehold Twp | Freehold NJ | 40-1516 | 74-1530 | 757 | 142 |
| 28-55721 | Ocean | Lakewood Twp | Lakewood NJ | 40-0219 | 74-1155 | 850 | 103 |
| 28-55730 | Monmouth | Marlboro Twp | Marlboro NJ | 40-1000 | 74-0810 | 600 | 81 |
| 28-55759 | Ocean | Brick Twp | Lakewood NJ | 40-0358 | 74-1012 | 711 | 3 |
| 28-55851 | Monmouth | Howell Twp | Adelphi NJ | 40-1246 | 74-1818 | 780 | 103 |
| 28-55869 | Monmouth | Freehold Twp | Freehold NJ | 40-1833 | 74-1503 | 682 | 198 |
| 28-55842 | Monmouth | Howell Twp | Keyport NJ-NY | 40-0444 | 74-1010 | 665 | 64 |
| 28-55963 | Monmouth | Freehold Boro | Freehold NJ | 40-1511 | 74-1609 | 668 | 157 |
| 28-56044 | Monmouth | Keyport Boro | Keyport NJ-NY | 40-1425 | 74-0149 | 745 | 69 |
| 28-56063 | Monmouth | Freehold Twp | Freehold NJ | 40-1825 | 74-1526 | 656 | 120 |
| 28-56173 | Monmouth | Monmouth Beach Boro | Long Branch East NJ | 40-1929 | 73-2841 | 850 | 7 |
| 28-56183 | Monmouth | Vail Twp | Asbury Park NJ | 40-0857 | 74-0727 | 1033 | 68 |
| 28-56219 | Monmouth | Marlboro Twp | Freehold NJ | 40-1923 | 74-1551 | 975 | 136 |
| 28-56299 | Ocean | Point Pleasant Beach Boro | Point Pleasant NJ | 40-0510 | 74-0251 | 168 | 8 |
| 28-56360 | Monmouth | Marlboro Twp | Freehold NJ | 40-1216 | 74-1509 | 717 | 114 |
| 28-56361 | Monmouth | Marlboro Twp | Freehold NJ | 40-1216 | 74-1509 | 717 | 114 |
| 28-56380 | Monmouth | Highlands Boro | Sandy Hook Neck NJ | 40-0203 | 73-5921 | 896 | 11 |
| 28-56527 | Monmouth | Marlboro Twp | Marlboro NJ | 40-1208 | 74-1452 | 700 | 114 |
| 28-56540 | Ocean | Brick Twp | Lakewood NJ | 40-0351 | 74-1033 | 7628 | 109 |
| 28-56847 | Monmouth | Howell Twp | Lakewood NJ | 40-0430 | 74-0833 | 1817 | 10 |
| 28-56947 | Monmouth | Howell Twp | Adelphi NJ | 40-1245 | 74-1820 | 766 | 102 |
| 28-57043 | Monmouth | Manalapan Twp | Farmingdale NJ | 40-1115 | 74-0115 | 679 | 15 |
| 28-57484 | Monmouth | Manalapan Twp | Adelphi NJ | 40-1434 | 74-2144 | 644 | 190 |
| 28-57401 | Monmouth | Manalapan Twp | Freehold NJ | 40-1734 | 74-1816 | 746 | 142 |
| 28-57484 | Monmouth | Freehold Twp | Asbury Park NJ | 40-1231 | 74-0139 | 1240 | 129 |
| 28-57484 | Monmouth | Freehold Twp | Freehold NJ | 40-1646 | 74-1737 | 895 | 111 |
| 28-57596 | Monmouth | Spring Lake Heights Boro | Asbury Park NJ | 40-0926 | 74-0212 | 967 | 29 |
| 28-57606 | Monmouth | Howell Twp | Farmingdale NJ | 40-1121 | 74-0131 | 900 | 108 |
| 28-57791 | Ocean | Brick Twp | Lakewood NJ | 40-0433 | 74-1038 | 1858 | 3 |
| 28-57874 | Ocean | Jackson Twp | Lakehurst NJ | 40-0425 | 74-2011 | 536 | 99 |
| 28-57903 | Monmouth | Keyport Boro | Point Pleasant Boro | 40-0316 | 74-0139 | 769 | 14 |
| 28-58011 | Monmouth | Freehold Twp | Freehold NJ | 40-1549 | 74-1912 | 254 | 161 |
| 28-58379 | Monmouth | Keyport Boro | Keyport NJ-NY | 40-1538 | 74-1215 | 964 | 38 |
| 28-58454 | Monmouth | Keyport Boro | Keyport NJ-NY | 40-1538 | 74-1215 | 964 | 38 |
| 28-58936 | Ocean | Jackson Twp | Adelphi NJ | 40-0653 | 74-1716 | 1660 | 138 |
| 28-59337 | Ocean | Jackson Twp | Lakehurst NJ | 40-0609 | 74-2072 | 1655 | 135 |
| 28-59370 | Monmouth | Union Beach Boro | Freehold NJ | 40-0533 | 74-2134 | 532 | 129 |
| 28-59107 | Monmouth | Vail Twp | Asbury Park NJ | 40-1107 | 74-0357 | 713 | 77 |
| 28-59259 | Ocean | Lakewood Twp | Lakewood NJ | 40-0438 | 74-1107 | 1692 | 69 |
| 28-59260 | Monmouth | Manalapan Twp | Freehold NJ | 40-1237 | 74-1934 | 773 | 104 |
| 28-59465 | Monmouth | Easttown Boro | Long Branch NJ | 40-1850 | 74-3031 | 1047 | 7 |
| 28-59580 | Monmouth | Milstone Boro | Keyport NJ-NY | 40-0269 | 74-1352 | 458 | 58 |
| 28-59617 | Monmouth | Atlantic Highlands Boro | Sandy Hook Neck NJ | 40-0243 | 74-0242 | 640 | 12 |
| 28-10810 | Monmouth | Arcadia Twp | Keyport NJ-NY | 40-2353 | 74-1240 | 556 | 90 |
| 28-11634 | Monmouth | Manalapan Twp | Freehold NJ | 40-1858 | 74-1909 | 848 | 142 |
| 28-11687 | Monmouth | Freehold Twp | Adelphi NJ | 40-1247 | 74-1716 | 1004 | 124 |
| 28-11735 | Monmouth | Nepune Twp | Asbury Park NJ | 40-1207 | 74-0097 | 860 | 106 |
| 28-11791 | Monmouth | Howell Twp | Lakewood NJ | 40-0700 | 74-0833 | 802 | 73 |
| 28-12342 | Monmouth | Union Beach Boro | Keyport NJ-NY | 40-0441 | 74-0910 | 309 | 15 |
| 28-12877 | Monmouth | Marlboro Twp | Freehold NJ | 40-1819 | 74-1530 | 815 | 139 |
| 28-13239 | Monmouth | Keyport Boro | Keyport NJ-NY | 40-1430 | 74-1214 | 960 | 37 |
| 28-13434 | Monmouth | Manalapan Twp | Freehold NJ | 40-1536 | 74-2011 | 569 | 138 |
| 28-13499 | Monmouth | Howell Twp | Adelphi NJ | 40-1212 | 74-1823 | 232 | 78 |
| 28-13809 | Monmouth | Freehold Twp | Adelphi NJ | 40-1302 | 74-1826 | 750 | 108 |
| 28-13819 | Monmouth | Freehold Twp | Adelphi NJ | 40-1306 | 74-1826 | 750 | 108 |
| 28-14313 | Monmouth | Marlboro Twp | Freehold NJ | 40-1744 | 74-1603 | 761 | 85 |
| 28-14513 | Monmouth | Freehold Twp | Freehold NJ | 40-1303 | 74-1934 | 723 | 104 |
| 28-15171 | Monmouth | Howell Twp | Asbury Park NJ | 40-1120 | 74-1155 | 1154 | 124 |
| 28-15257 | Monmouth | Freehold Twp | Marlboro NJ | 40-1517 | 74-1531 | 1320 | 202 |
| 28-15728 | Monmouth | Howell Twp | Lakewood NJ | 40-0606 | 74-0911 | 700 | 106 |
| 28-15765 | Monmouth | Cole Neck Twp | Marlboro NJ | 40-1537 | 74-1352 | 309 | 124 |
| 28-17804 | Monmouth | Howell Twp | Adelphi NJ | 40-1268 | 74-1541 | 121 | 115 |
| 28-17865 | Monmouth | Howell Twp | Adelphi NJ | 40-1254 | 74-1543 | 280 | 120 |
| 28-17876 | Monmouth | Howell Twp | Adelphi NJ | 40-1256 | 74-1543 | 280 | 120 |
| 28-17871 | Monmouth | Marlboro Twp | Freehold NJ | 40-1923 | 74-1551 | 604 | 135 |
| 28-17963 | Monmouth | Vail Twp | Asbury Park NJ | 40-1116 | 74-0521 | 456 | 86 |
| 28-18000 | Monmouth | Howell Twp | Farmingdale NJ | 40-1105 | 74-0131 | 1676 | 122 |
| 28-19060 | Monmouth | Howell Twp | Farmingdale NJ | 40-0654 | 74-0709 | 413 | 116 |
| 28-20001 | Monmouth | Freehold Twp | Lakewood NJ | 40-0627 | 74-0666 | 747 | 86 |
| 28-20020 | Monmouth | Union Beach Boro | Asbury Park NJ | 40-1140 | 74-0149 | 262 | 122 |
| 28-20066 | Monmouth | Aberdeen Twp | Keyport NJ-NY | 40-0440 | 74-1928 | 406 | 80 |
| 28-20067 | Monmouth | Aberdeen Twp | Keyport NJ-NY | 40-0440 | 74-1928 | 406 | 80 |
| 28-21616 | Monmouth | Cole Neck Twp | Long Branch NJ | 40-1901 | 74-3067 | 691 | 44 |
| 28-21671 | Monmouth | Cole Neck Twp | Long Branch NJ | 40-1907 | 74-3069 | 677 | 33 |
| 28-21692 | Monmouth | Cole Neck Twp | Long Branch NJ | 40-1907 | 74-3069</ | | |

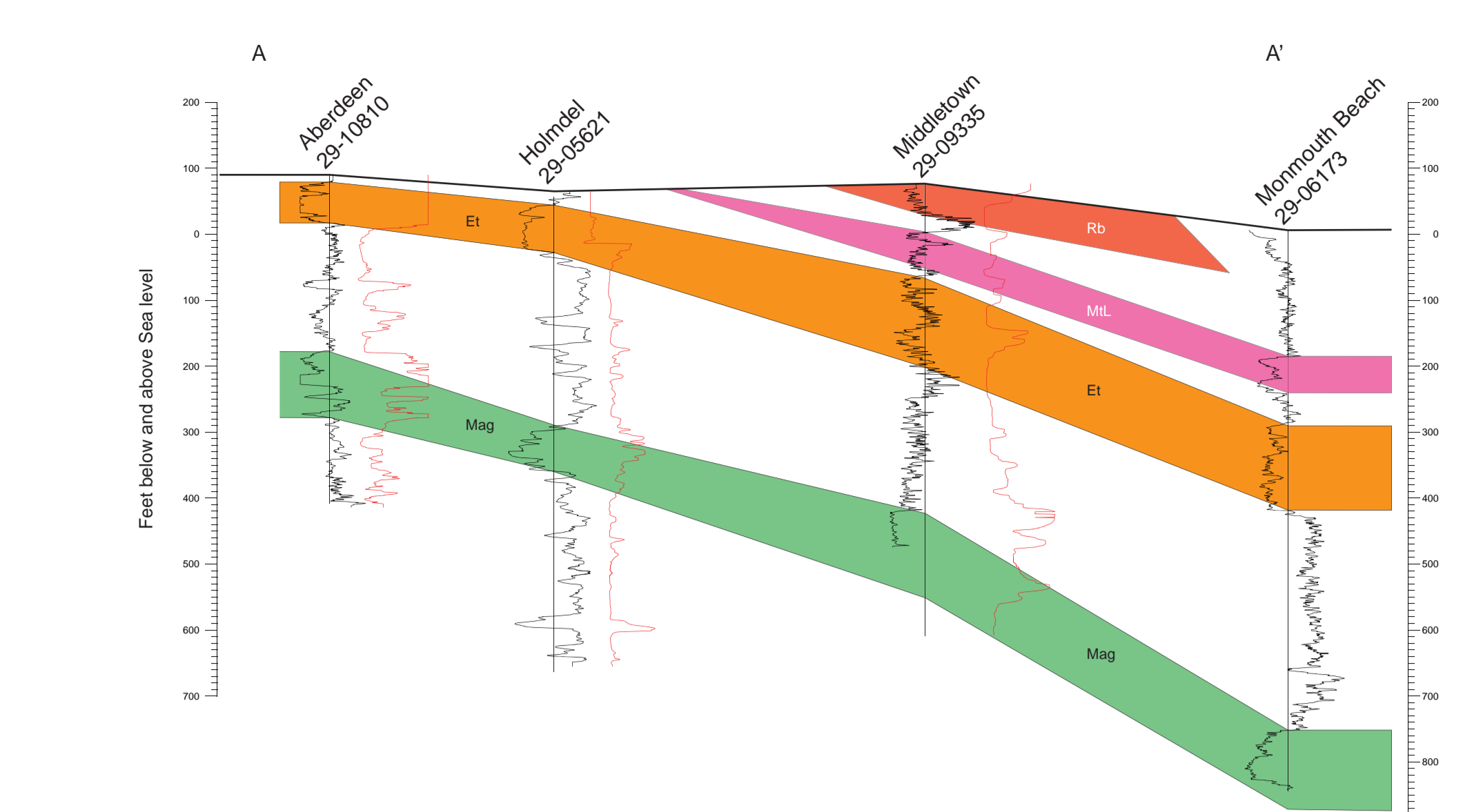


Figure 4 Hydrogeologic section A-A'

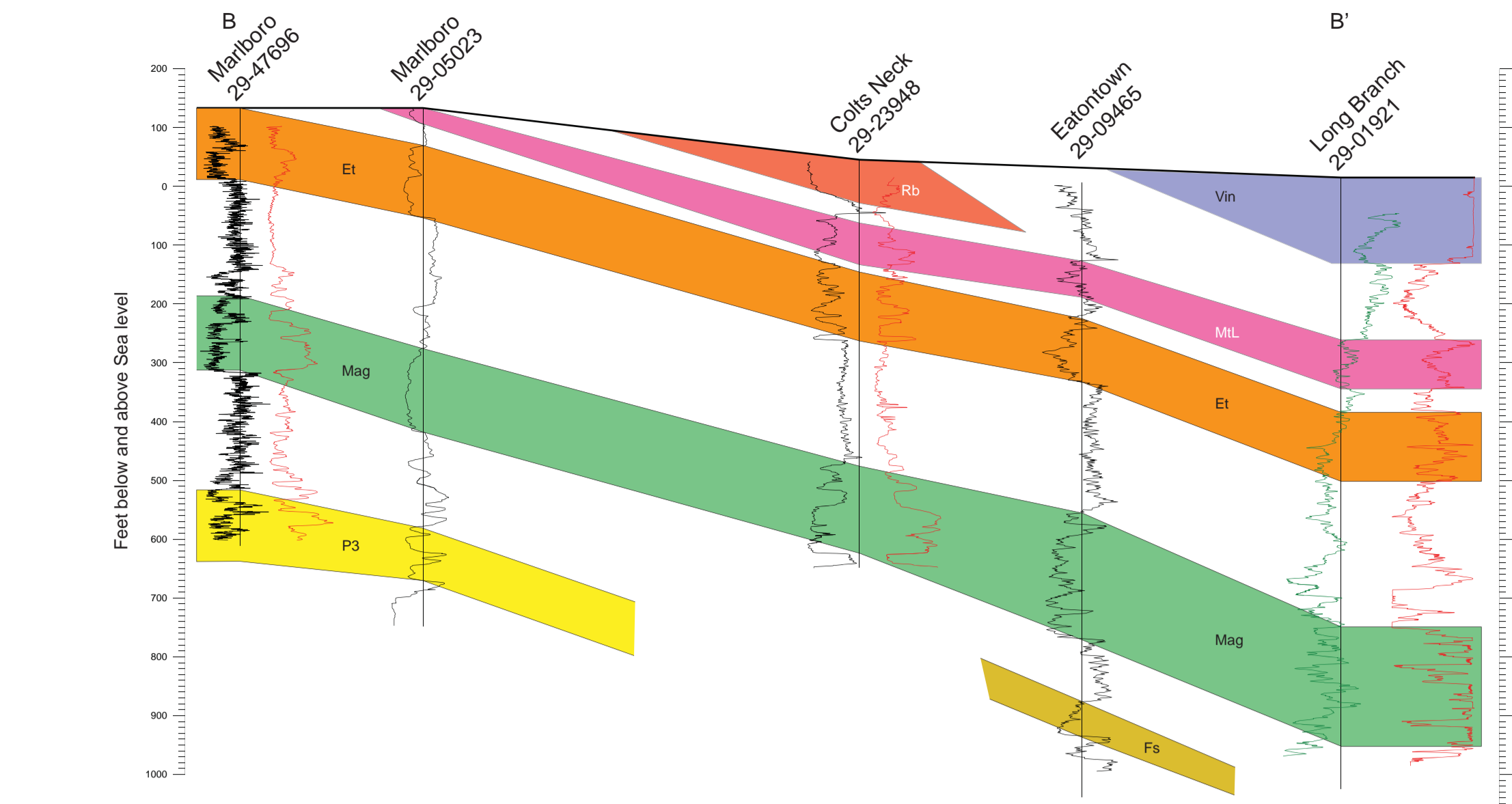


Figure 5 Hydrogeologic section B-B'

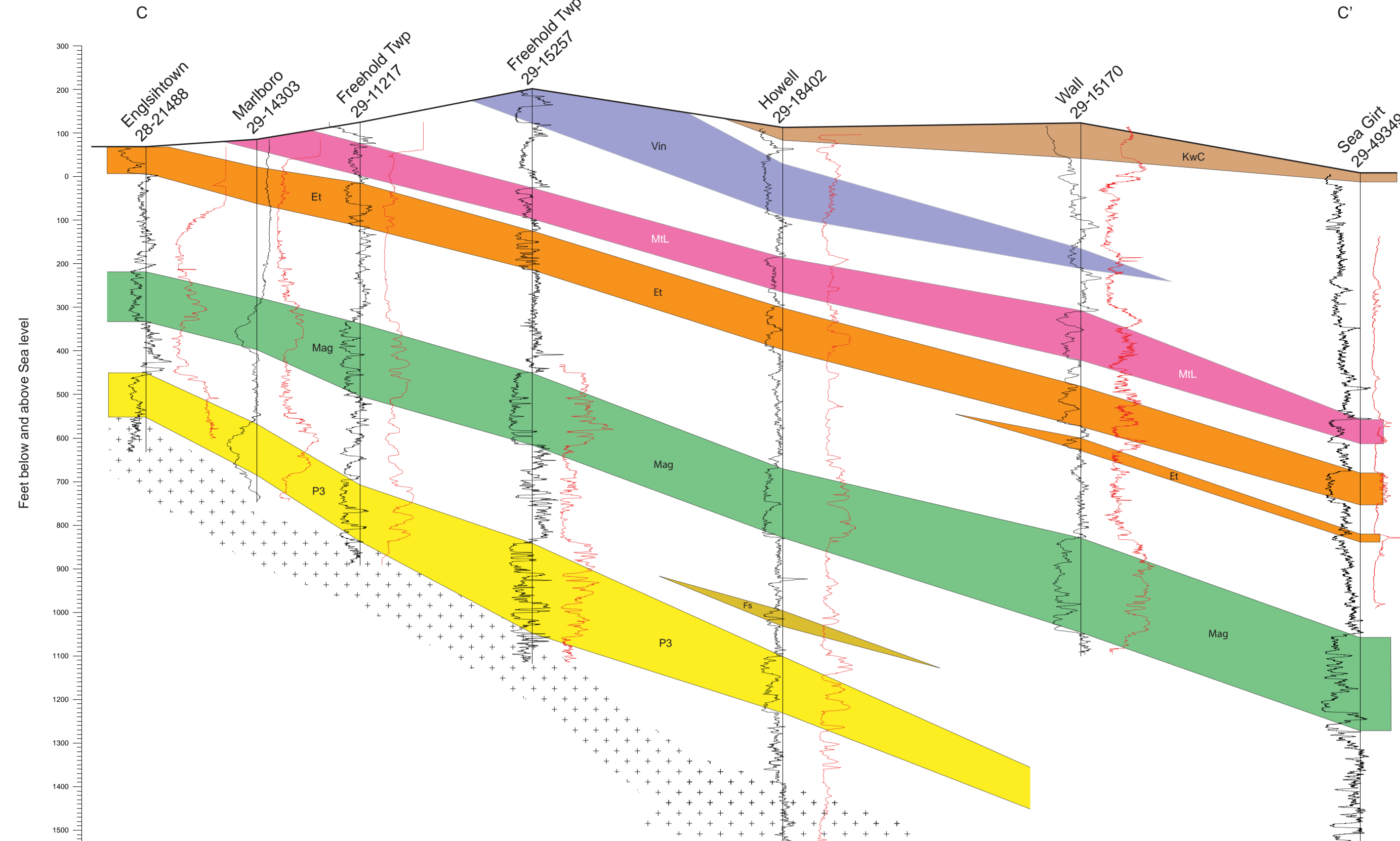


Figure 6 Hydrogeologic section C-C'

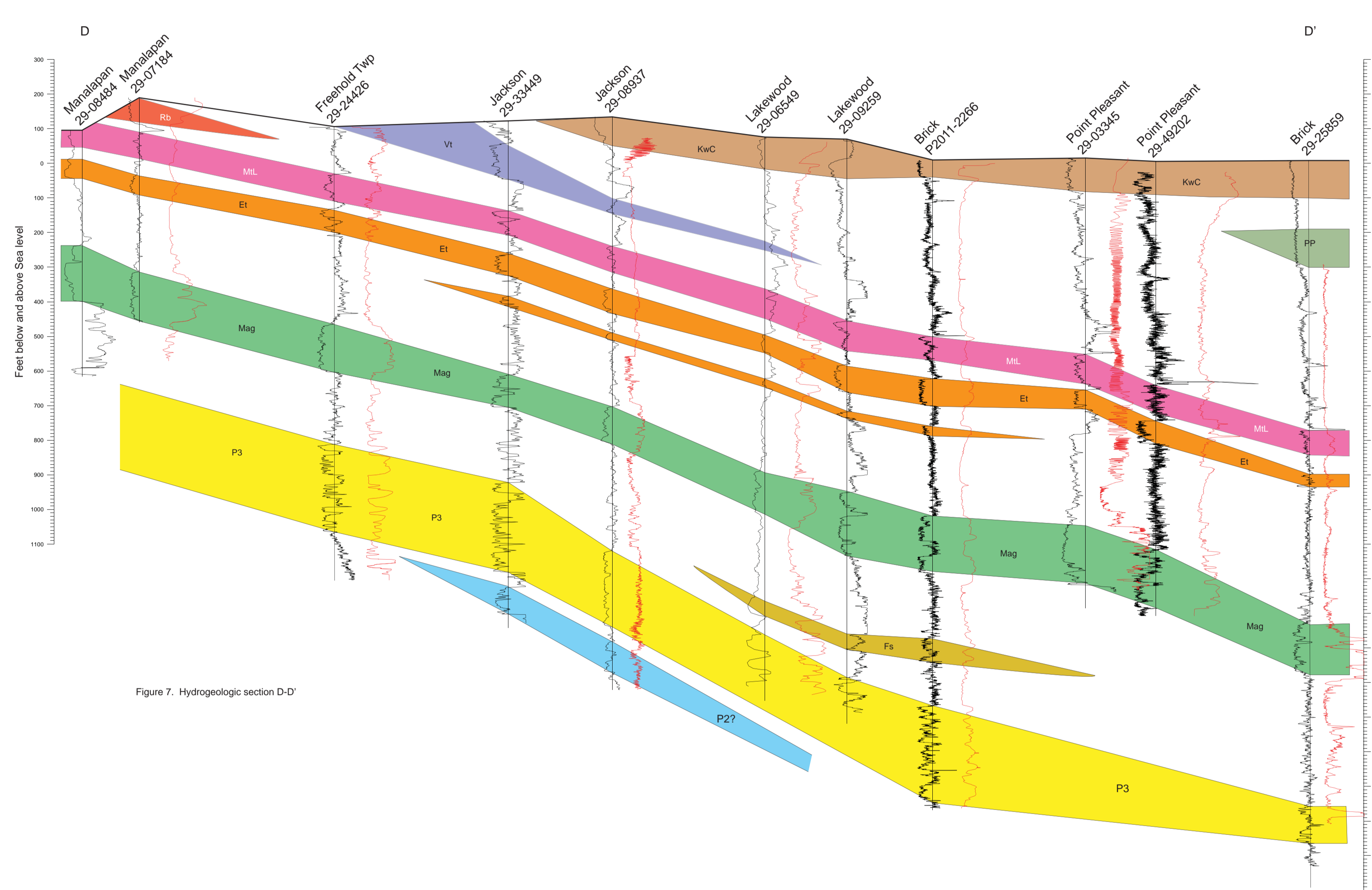


Figure 7. Hydrogeologic section D-D'

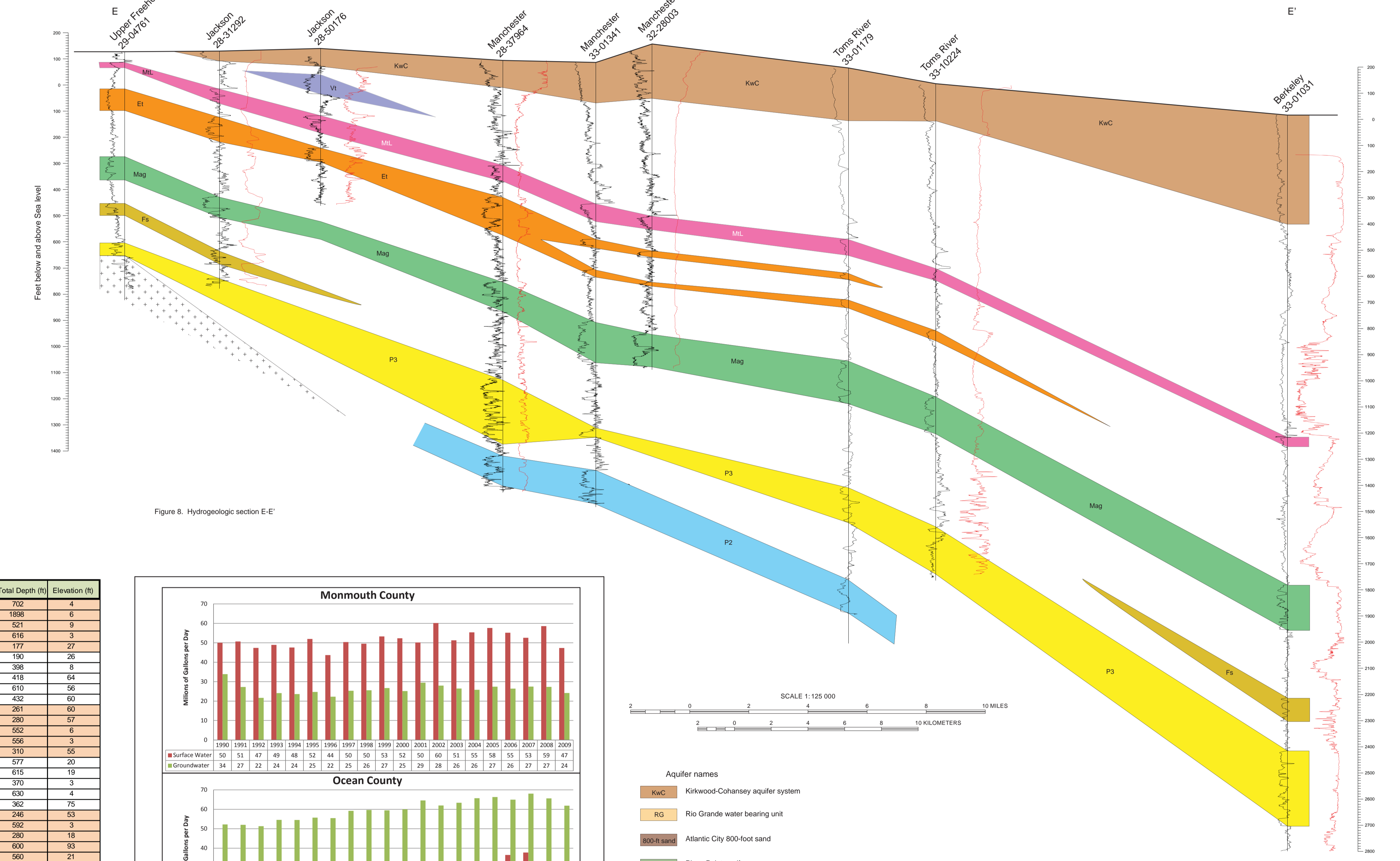


Figure 8. Hydrogeologic section E-E'

Table 1. New Jersey permit number, well location and total depth of wells used in this study (continued).

| NJ Permit | County | Municipality | Quadrangle Name | Latitude (ddmmss) | Longitude (ddmmss) | Total Depth (ft) | Elevation (ft) |
|-----------|----------|-------------------------------|-------------------|-------------------|--------------------|------------------|----------------|
| 29-32175 | Monmouth | Bradley Beach Boro | Asbury Park NJ | 401228 | 740058 | 280 | 17 |
| 29-33449 | Ocean | Jackson Twp | Ashepita NJ | 400915 | 741736 | 1463 | 122 |
| 29-33501 | Ocean | Jackson Twp | Ashepita NJ | 400915 | 741736 | 286 | 138 |
| 29-36217 | Monmouth | Sea Breeze Boro | Sandy Hook NJ | 402352 | 742638 | 307 | 7 |
| 29-38111 | Monmouth | Colts Neck Twp | Marlboro NJ | 401658 | 741023 | 294 | 102 |
| 29-39193 | Monmouth | Farmingdale Boro | Farmingdale NJ | 401113 | 740308 | 123 | 59 |
| 29-40257 | Monmouth | Wall Twp | Point Pleasant NJ | 400768 | 740496 | 197 | 83 |
| 29-41238 | Monmouth | Freehold Twp | Farmingdale NJ | 401129 | 740817 | 178 | 161 |
| 29-41789 | Ocean | Toms River Twp | Lakehurst NJ | 400227 | 741436 | 2286 | 30 |
| 29-43208 | Monmouth | Howell Twp | Farmingdale NJ | 401407 | 741513 | 233 | 119 |
| 29-43286 | Monmouth | Colts Neck Twp | Marlboro NJ | 401854 | 741029 | 714 | 88 |
| 29-43285 | Ocean | Lakehurst Boro | Lakehurst NJ | 400207 | 741831 | 1470 | 686 |
| 29-44821 | Monmouth | Deal Boro | Asbury Park NJ | 401438 | 740302 | 152 | 9 |
| 29-44870 | Ocean | Jackson Twp | Ashepita NJ | 400919 | 741731 | 1402 | 143 |
| 29-46035 | Ocean | Jackson Twp | Ashepita NJ | 400903 | 741833 | 725 | 145 |
| 29-45777 | Monmouth | Colts Neck Twp | Marlboro NJ | 401025 | 741047 | 652 | 89 |
| 29-47462 | Monmouth | Colts Neck Twp | Marlboro NJ | 401180 | 741123 | 280 | 108 |
| 29-47607 | Monmouth | Marlboro Twp | Freehold NJ | 402108 | 741668 | 725 | 123 |
| 29-47608 | Monmouth | Marlboro Twp | Freehold NJ | 402102 | 741667 | 460 | 132 |
| 29-47686 | Monmouth | Marlboro Twp | Freehold NJ | 402102 | 741667 | 746 | 133 |
| 29-48307 | Monmouth | Colts Neck Twp | Long Branch NJ | 401804 | 740713 | 380 | 73 |
| 29-48501 | Ocean | Manchester Twp | Lakehurst NJ | 400143 | 741159 | 1041 | 75 |
| 29-48826 | Monmouth | Gateway Nat'l Recreation Area | Sandy Hook NJ-NY | 402706 | 740002 | 911 | 15 |
| 29-49202 | Ocean | Point Pleasant Boro | Point Pleasant NJ | 400409 | 740405 | 1309 | 7 |
| 29-49349 | Monmouth | Sea Girt Boro | Point Pleasant NJ | 400712 | 740160 | 1593 | 9 |
| 29-48576 | Monmouth | Manalapan Twp | Ashepita NJ | 401436 | 742147 | 265 | 187 |
| 29-52588 | Ocean | Jackson Twp | Lakehurst NJ | 400707 | 741612 | 837 | 113 |
| 29-52270 | Ocean | Jackson Twp | Lakehurst NJ | 400326 | 741585 | 1161 | 104 |
| 29-52272 | Ocean | Jackson Twp | Lakehurst NJ | 400329 | 741586 | 1775 | 103 |
| 29-52273 | Ocean | Jackson Twp | Lakehurst NJ | 400554 | 741718 | 643 | 137 |
| 29-52683 | Monmouth | Freehold Twp | Farmingdale NJ | 400869 | 740883 | 597 | 57 |
| 29-55505 | Ocean | Lakehurst Twp | Lakehurst NJ | 400823 | 741339 | 665 | 70 |
| 32-00069 | Ocean | Barnegat Twp | Brookville NJ | 394647 | 742025 | 1741 | 164 |
| 32-00434 | Ocean | Whiting NJ | Tuckerton NJ | 395322 | 742252 | 389 | 129 |
| 32-00447 | Ocean | Little Egg Harbor Twp | Tuckerton NJ | 393428 | 742205 | 654 | 21 |
| 32-00479 | Ocean | Tuckerton Boro | Tuckerton NJ | 393610 | 742030 | 652 | 7 |
| 32-00609 | Ocean | Little Egg Harbor Twp | New Greens NJ | 393252 | 742308 | 697 | 6 |
| 32-07902 | Ocean | Little Egg Harbor Twp | New Greens NJ | 393310 | 742308 | 352 | 7 |
| 32-08457 | Ocean | Stafford Twp | Brookville NJ | 394555 | 742138 | 3300 | 112 |
| 32-13339 | Ocean | Little Egg Harbor Twp | New Greens NJ | 393252 | 742308 | 583 | 7 |
| 32-22508 | Ocean | Tuckerton Boro | Tuckerton NJ | 393535 | 742019 | 503 | 6 |
| 32-22509 | Ocean | Tuckerton Boro | Tuckerton NJ | 393533 | 742022 | 546 | 4 |
| 32-23912 | Ocean | Little Egg Harbor Twp | West Creek NJ | 393229 | 742031 | 543 | 63 |
| 32-25614 | Ocean | Little Egg Harbor Twp | Tuckerton NJ | 393518 | 742153 | 550 | 31 |
| 32-27575 | Ocean | Little Egg Harbor Twp | West Creek NJ | 393735 | 742005 | 532 | 78 |
| 32-28003 | Ocean | Manchester Twp | Kewick Grove NJ | 395739 | 742127 | 1245 | 158 |
| 32-00043 | Ocean | Barnegat Twp | Brookville NJ | 394817 | 741933 | 1759 | 151 |
| 32-00046 | Ocean | Barnegat Twp | Toms River NJ | 395433 | 742120 | 1805 | 39 |
| 32-00047 | Ocean | Barnegat Twp | Seaside Park NJ | 395897 | 740834 | 1509 | 7 |
| 32-00048 | Ocean | Barnegat Twp | Barnegat Light NJ | 394624 | 741675 | 615 | 6 |
| 32-00049 | Ocean | Harvey Cedars Boro | Ship Bottom NJ | 394218 | 740008 | 706 | 5 |
| 32-00051 | Ocean | Toms River Twp | Toms River NJ | 395804 | 741024 | 404 | 25 |
| 32-00053 | Ocean | Stafford Twp | Ship Bottom NJ | 393518 | 741024 | 460 | 40 |
| 32-00131 | Ocean | Barnegat Twp | Barnegat Light NJ | 394829 | 740535 | 3891 | 15 |
| 32-00138 | Ocean | Ocean Twp | Forked River NJ | 394742 | 741021 | 465 | 50 |
| 32-00139 | Ocean | Pine Beach Boro | Toms River NJ | 393518 | 741013 | 415 | 32 |
| 32-00191 | Ocean | Ship City Boro | Ship Bottom NJ | 393038 | 740497 | 567 | 5 |
| 32-00117 | Ocean | South Toms River Boro | Toms River NJ | 395609 | 740209 | 1230 | 16 |
| 32-00134 | Ocean | Ship Bottom Boro | Barnegat Light NJ | 394625 | 741675 | 410 | 32 |
| 32-00119 | Ocean | Toms River Twp | Seaside Park NJ | 395806 | 740509 | 1511 | 5 |
| 32-00179 | Ocean | Toms River Twp | Toms River NJ | 395829 | 741024 | 2255 | 66 |
| 32-00136 | Ocean | Barnegat Light Boro | Barnegat Light NJ | 394622 | 740608 | 682 | 26 |
| 32-00128 | Ocean | Ship City Boro | Ship Bottom NJ | 393048 | 740505 | 607 | 6 |
| 32-00275 | Ocean | Long Beach Twp | Beach Haven NJ | 393509 | 741328 | 669 | 4 |
| 32-00341 | Ocean | Manchester Twp | Kewick Grove NJ | 395891 | 742100 | 1730 | 88 |
| 32-00342 | Ocean | Manchester Twp | Kewick Grove NJ | 395896 | 742138 | 1621 | 101 |
| 32-00343 | Ocean | Manchester Twp | Kewick Grove NJ | 395892 | 742137 | 1653 | 88 |
| 32-00349 | Ocean | Manchester Twp | Forked River NJ | 394627 | 741443 | 360 | 44 |
| 32-00256 | Ocean | Barnegat Twp | Forked River NJ | 394520 | 741315 | 103 | 28 |
| 32-00241 | Ocean | Beach Haven Boro | Beach Haven NJ | 393343 | 741433 | 751 | 4 |
| 32-00260 | Ocean | Stafford Twp | West Creek NJ | 394861 | 741267 | 1597 | 121 |
| 32-00676 | Ocean | Barnegat Light Boro | Long Beach NJ | 394454 | 740535 | 676 | 6 |



| Table 2. Summary of aquifer tests on file with the New Jersey Geological and Water Survey. File Number identifies a particular aquifer test in the NJGWS paper files and in the Hydro database. Site Name identifies the test well and owner. Aquifer Designation is the name of the aquifer in which the test was completed. Conditions, "Leaky" and "Confined" indicates the hydraulic behavior observed in the time-drawdown data; the modifier "confined" also indicates that the aquifer is "Leaky/Unconfined" indicating leakage from a confining aquifer. Aquifer Properties are values obtained from an analysis of the time-drawdown data. T is transmissivity in ft/day; K is hydraulic conductivity in ft/day; Kv is vertical hydraulic conductivity in ft/day; b is aquifer thickness in feet; S is storativity (dimensionless); Sy is specific yield (dimensionless); r is leakage in ft/day. | | | | |
|--|--|--|------------------|---|
| File Number | Site Name | Aquifer Designation | Conditions | Aquifer Properties |
| 1 | United Water Toms River Berkeley Station Well 34 | Kirkwood-Cohansey water-table aquifer system | Leaky/Unconfined | T=7000 S=0.000281 d=0.01 |
| 13 | Ciba Geigy Well 754-1000 | Atlantic City 700'-foot sand aquifer | Unconfined | K=1603.5 S=0.00051 d=0.043 |
| 14 | Ciba Geigy Well 746-1000 | Atlantic City 700'-foot sand aquifer | Leaky/Unconfined | T=48000 S=0.00012 d=0.062 |
| 15 | Ciba Geigy Well 749-1000 | Atlantic City 700'-foot sand aquifer | Unconfined | K=10.2 d=1.5 S=0.00042 Sy=0.19 |
| 17 | Ocean Township MJA Well 6 | Atlantic City 700'-foot sand aquifer | Confined | T=6200 S=0.0006 |
| 20 | Manchester Tap MJA Well 10 | Magogy aquifer | Leaky/Unconfined | T=3700 S=0.00097 d=0.0045 |
| 31 | United Water Toms River Well 40 | Piney Point aquifer | Confined | T=5100 S=0.00036 |
| 32 | Freehold Township MJA Point by Well 9 | Englishman aquifer system | Confined | T=3300 S=0.00071 |
| 34 | United Water Toms River Well 42 | Magogy aquifer | Confined | T=11800 S=0.00011 d=0.0045 |
| 37 | Naval Air Engineering Center RVM-1 | Kirkwood-Cohansey water-table aquifer system | Unconfined | K=67 S=0.0003 S=0.00083 Sy=0.19 |
| 46 | United Water Toms River Well 15 | Piney Point aquifer | Confined | T=789 |
| 47 | Long Beach TMA Beach Haven Terrace Well 4 | Atlantic City 700'-foot sand aquifer | Unconfined | T=3900 S=0.00041 d=0.077 |
| 51 | Manalapan Township MJA Well 3 | Englishman aquifer system | Leaky/Confined | T=4250 S=0.0035 d=0.011 |
| 56 | New Jersey Water Addition System Well 6 | Mount Laurel-Venonah aquifer | Leaky/Unconfined | T=7350 S=0.00001 d=0.0008 |
| 97 | Bacon Hill Well 1 | Magogy aquifer | Confined | T=2200 S=0.0001 |
| 103 | Jackson Township MJA Well 12 (ASR) | Magogy aquifer | Leaky/Unconfined | T=1200 S=0.00018 d=0.0003 |
| 110 | Freehold Township MJA Well 11 | middle Potomac-Raritan-Magogy aquifer | Confined | T=2200 S=0.0001 |
| 112 | Barnegat Township MJA Well 7 | Rio Grande water-bearing zone | Leaky/Unconfined | T=1100 S=0.00011 d=0.0002 |
| 114 | Stafford Twp Water & Sewer Department Well 6 | Atlantic City 700'-foot sand aquifer | Leaky/Unconfined | T=5700 S=0.0014 d=0.0072 |
| 115 | Lakewood Cogeneration Well 14 | Kirkwood-Cohansey water-table aquifer system | Unconfined | K=150.8 d=1.7 S=0.0011 Sy=0.03 K=6.7 |
| 121 | United Water Toms River Well 44 | Kirkwood-Cohansey water-table aquifer system | Unconfined | K=10100 S=0.00001 d=0.0001 |
| 168 | Lacey Township MJA Well 5 | Atlantic City 700'-foot sand aquifer | Leaky/Unconfined | T=25000 S=0.0022 d=0.011 |
| 170 | Baldy Water Company Well 6 | Kirkwood-Cohansey water-table aquifer system | Leaky/Unconfined | T=11000 S=0.00071 d=0.0014 |
| 179 | Jumping Brook Golf Course Well IR-1 | Vincennes aquifer | Confined | T=2300 S=0.00037 |
| 180 | Sessale Heights Borough Well 17 | Potomac-Raritan-Magogy aquifer system | Confined | T=2600 S=0.00042 |
| 182 | Lacey Township MJA Test Well #11H Street | Piney Point aquifer | Confined | T=4440 S=0.00027 |
| 187 | United Water Toms River Well 45 | Magogy aquifer | Leaky/Unconfined | T=4400 S=0.00027 d=0.0007 |
| 189 | Lakewood Borough Well 3 | Atlantic City 700'-foot sand aquifer | Leaky/Unconfined | T=6500 S=0.0014 d=0.0009 |
| 194 | Six Flags Great Adventure Well 14 | Magogy aquifer | Leaky/Unconfined | T=11500 S=0.00081 d=0.0008 |
| 200 | Tuckerton Borough Well 15 | Magogy aquifer | Leaky/Confined | T=1200 S=0.00018 d=0.0013 |
| 204 | West Lake Water Irrigation Well 1 | Kirkwood-Cohansey water-table aquifer system | Unconfined | K=180 d=0.5 S=0.0011 Sy=0.03 K=6.1 |
| 214 | DuSoy County Club Well 1 | Englishman aquifer system | Unconfined | T=6000 S=0.00063 |
| 221 | K Hovanian at Little Egg Harbor Well 10 | Atlantic City 700'-foot sand aquifer | Unconfined | T=5700 S=0.0005 |
| 231 | Six Flags Great Adventure Well IR-1 | Englishman aquifer system | Leaky/Unconfined | T=1000 S=0.0006 d=0.0008 |
| 238 | Fox Runpoint at Wall View 3141 | Piney Point aquifer | Leaky/Unconfined | T=4800 S=0.00021 d=0.0002 |
| 240 | Greenbriar at Waterview Well 1 | Atlantic City 700'-foot sand aquifer | Leaky/Unconfined | T=9500 S=0.00034 d=0.0003 |
| 240 | Stafford Twp Water & Sewer Department Well 7 | Atlantic City 700'-foot sand aquifer | Leaky/Unconfined | T=6800 S=0.0021 d=0.0017 |
| 243 | Long County Club Well R-1 | Connecticut aquifer | Leaky/Unconfined | T=1000 S=0.00071 d=0.0002 |
| 244 | Long Beach Township Petals Park Well 1 | Atlantic City 700'-foot sand aquifer | Confined | T=12000 S=0.00019 |
| 256 | Crestwood Village Co. Well 7 | Kirkwood-Cohansey water-table aquifer system | Unconfined | K=70.7 S=0.000303 Sy=0.006 K=40.6 d=0.2 |
| 258 | Essex Ridge Golf Course Well 7A | Kirkwood-Cohansey water-table aquifer system | Unconfined | K=130 d=1.1 S=0.00051 d=0.004 d=0.7 |
| 266 | Berkley Township MJA Well 2 | Piney Point aquifer | Confined | T=1700 S=0.0023 |
| 267 | Shore Golf Enterprises Inc Well IR-1 | Vincennes aquifer | Unconfined | K=210 S=0.0001 S=0.00051 d=0.004 d=0.77 |
| 273 | Jackson Township MJA Well 13 | middle Potomac-Raritan-Magogy aquifer | Unconfined | T=3600 S=0.0002 |
| 282 | Beachwood Borough Well 1 | Atlantic City 700'-foot sand aquifer | Confined | T=8400 |
| 282 | Lighthouse As associates Well 5 | Atlantic City 700'-foot sand aquifer | Leaky/Unconfined | T=1700 S=0.00041 d=0.0006 |
| 293 | Jackson Township MJA Well 15 | middle Potomac-Raritan-Magogy aquifer | Unconfined | T=5400 |
| 294 | Freehold Township MJA Well 9 | Magogy aquifer | Confined | T=8500 |
| 294 | Lacey Township MJA Box Street Test Well | Atlantic City 700'-foot sand aquifer | Leaky/Unconfined | T=12000 S=0.00025 d=0.0043 |
| 295 | Freehold Township MJA Well 10 | Atlantic City 700'-foot sand aquifer | Leaky/Unconfined | T=4400 S=0.00051 d=0.0019 |
| 298 | Crestwood Village Water Co Well 11 | Magogy aquifer | Leaky/Confined | T=4000 S=0.0023 d=0.0002 |
| 298 | New American Water Swimming River Well 1 (ASR) | Magogy aquifer | Leaky/Confined | T=6400 S=0.00018 d=0.0014 |
| 300 | Atlantic Holmes Inc Well 1 | Atlantic City 700'-foot sand aquifer | Leaky/Unconfined | T=11000 S=0.00065 d=0.0001 |
| 303 | Barnegat Township MJA Well 6 | Atlantic City 700'-foot sand aquifer | Leaky/Unconfined | T=10000 S=0.0045 d=0.00034 |
| 307 | Metcross National Golf Club Well 1 | Magogy aquifer | Confined | T=3680 |
| 310 | United Water Toms River Well 21 | Cohansey aquifer | Leaky/Unconfined | T=16000 S=0.022 d=0.085 |
| 316 | Frog Pond Estates Test Well 1 | Atlantic City 700'-foot sand aquifer | Confined | T=1400 S=0.0016 |
| 322 | Pinecroft Estates Well 1 | Atlantic City 700'-foot sand aquifer | Leaky/Unconfined | T=7400 |
| 326 | Stafford Twp Water & Sewer Department Well 8 | Atlantic City 700'-foot sand aquifer | Unconfined | T=10000 S=0.00051 d=0.0005 |
| 328 | Stafford Twp Water & Sewer Department Well 12 | Atlantic City 700'-foot sand aquifer | Confined | T=8900 |
| 334 | Lakewood Borough Well 3 | lower Potomac-Raritan-Magogy aquifer | Confined | T=4000 |
| 326 | Atlantic Highlands Borough Well 6 | Englishman aquifer system | Leaky/Unconfined | T=3800 S=0.0002 d=0.0002 |
| 328 | Stafford Twp Water & Sewer Department Well 5 | Atlantic City 700'-foot sand aquifer | Confined | T=5400 S=0.0001 |
| 342 | Lacey Township MJA Test Well 6 | Magogy aquifer | Leaky/Unconfined | T=3800 S=0.00021 d=0.0001 |
| 343 | Lacey Township MJA Test Well 7 | Magogy aquifer | Confined | T=7200 |
| 345 | Pine Beach Borough Well 1 | Kirkwood-Cohansey water-table aquifer system | Leaky/Unconfined | T=6800 S=0.00055 d=0.0036 |
| 351 | NJ American Water New Egg Station Well 1A | Englishman aquifer system | Leaky/Unconfined | T=250 S=0.0001 |
| 357 | Shorelands Water Co Inc Well 7 | Magogy aquifer | Leaky/Unconfined | T=2100 |