GROUND-WATER CONDITIONS IN THE BLANCHARD-OLDTOWN AREA

by
Steven J. Baker

Idaho Department of Water Resources
Boise, Idaho

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The Idaho Department of Water Resources has periodically received complaints from water users in the Blanchard-Oldtown area of declining water levels in their wells. In response to these concerns, a reconnaissance level investigation of the ground-water conditions in the area was performed by the department.

The findings from this study are presented in the following manner. The geologic framework of the area is outlined first. This is followed by a discussion of the hydrologic regime, which describes the generalized ground-water flow conditions that occur in the area. And finally, a comparison between the water yield and resource development is presented in the water budget section.

Geologic Framework

Throughout the Blanchard-Oldtown area, crystalline bedrock occurs at or near the surface in the surrounding highlands. The configuration of its surface below the intervening lowlands has been inferred from geologic maps of the region (Miller, 1974; Aadland and Bennett, 1979) and well log data. The shape of the buried bedrock apparently resembles a narrow trough or valley. The extent of the bedrock valley is largely defined by the contact between the alluvium and bedrock shown on Figure 1, especially along the margins of Hoodoo Mountain to the east and the bordering mountains to the southwest and west (not shown in Figure 1). The northwestern boundary of the valley is formed by a bedrock high whose southern extent is exposed in Section 13, Township 55 North, Range 6 West as well as in Washington. Immediately south of this area, a minor tributary valley trending northwest-southeast occurs and has its confluence with the main valley in the vicinity of Tweedie, Washington.

The general slope of the bedrock surface appears to be fairly steep and abrupt towards the axis of the valley. However, two known deviations from this occur where buried bedrock ridges extend to the west off of Hoodoo Mountain. The larger of the two lies just south of the Pend Oreille River and consists of a subsurface extension of a ridge exposed in Section 32, Township 56 North, Range 5 West. The other buried ridge whose axis roughly coincides with the border of Sections 19 and 30, Township 55 North, Range 5 West, has a considerably more subdued surface expression.

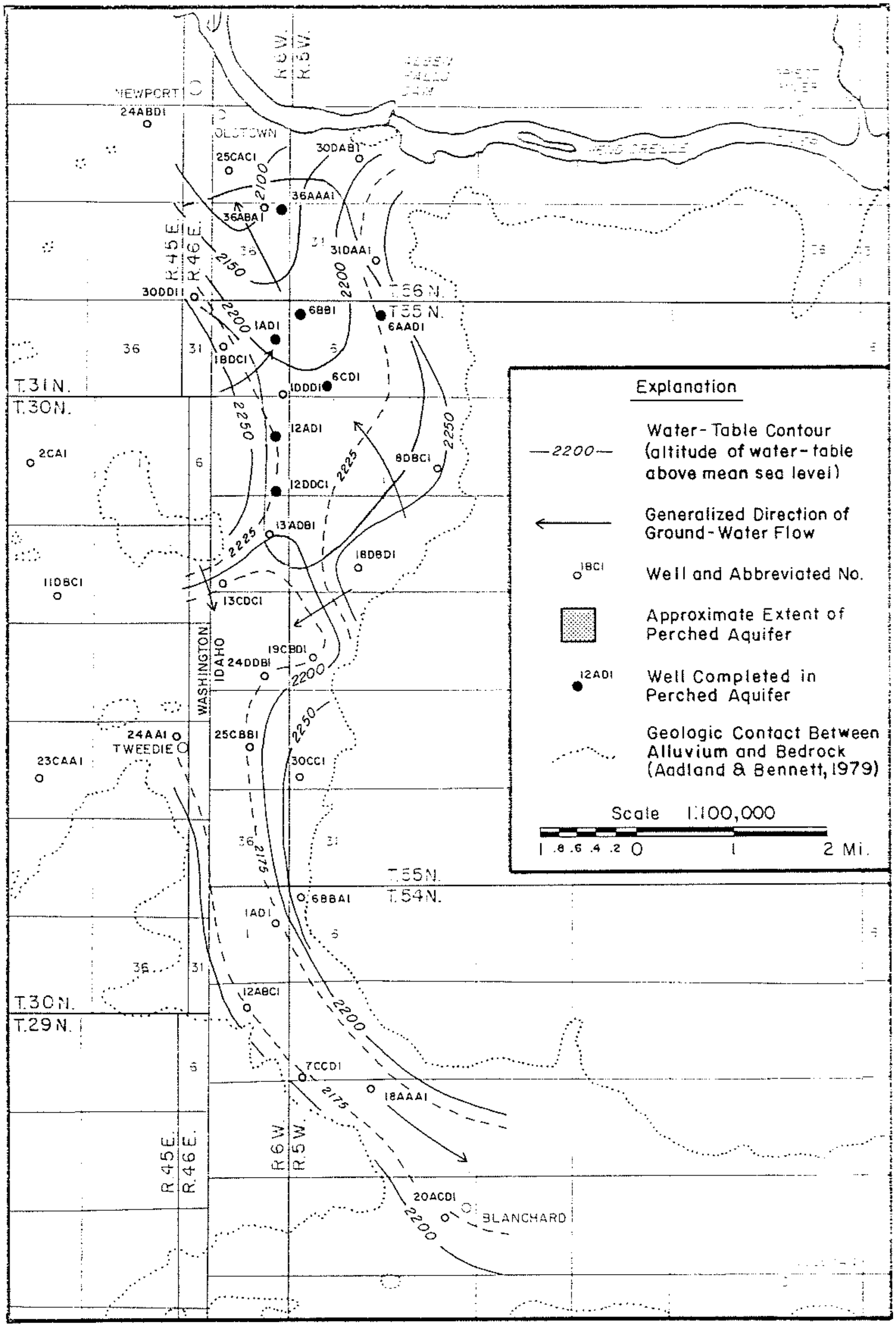

Figure I. Approximate Configuration of the Water-Table in the Blanchard-Oldtown Area.

According to previous studies regarding the drainage history of the region (Anderson, 1927; Alden, 1953; Conners, 1976), there is strong evidence that the Pend Oreille Valley below Oldtown was not always occupied by a northward-flowing stream. The wide obtuse angles of the tributaries entering the Pend Oreille River and the narrow youthful canyon near Metaline Falls, Washington (at its apparent ancestral headwaters), all suggest a previous drainage to the south. Outflow from the ancestral stream was thought to have been through the Little Spokane Valley, however, based on a comparison of the altitudes of the bedrock surface, a drainage to the south towards Blanchard for at least part of its drainage history is more likely. Southeast of Blanchard, the stream apparently merged with a major ancestral drainage system in Rathdrum Prairie (Anderson, 1927).

During the Pleistocene (2 million to 10,000 years ago), glacial activity significantly modified the shape of the valley and was responsible for most of the sediment accumulation in the area (Alden, 1953; Conners, 1976). Scouring of the bedrock occurred as glacial ice advanced into the region from the north and caused the valley to be widened and deepened, especially in the northern part. Glacial till, which is composed of a heterogeneous mixture of rock debris and sediment, was deposited directly by the ice in the northern part of the valley. Meltwater from the ice deposited sands and gravels in the southern part of the valley. Upon the retreat of the glacial ice, coarse outwash accumulated on top of the till in the northern part of the valley. The thickness of the valley fill exceeds 300 feet in the vicinity of Oldtown and is at least 200 feet near Blanchard.

Hydrologic Regime

Ground water occurs in both the bedrock and overlying sediments; however, their ability to store and transmit water vary considerably. Fractures within the bedrock provide the only avenues for ground water to move through. Although some fracture zones may be extremely transmissive, their size and extent is generally limited and as a result so is their storage capacity. Wells completed in the bedrock have reported discharges of less than 10 gallons per minute. The water-bearing properties of the sediment are governed by the degree of interconnection between the individual pore spaces. Since these openings are larger in the coarser grained deposits, sands and gravels can store and convey substantially greater quantities of water than silts and clays.

Production data from wells completed in the sediments indicate that specific capacities range from less than 1 to almost 10 gallons per minute per foot of drawdown (gpm/ft) for fine sands and silts, to greater than 75 gpm/ft for coarse sands and gravels. By utilizing a particular value for specific capacity, an approximate amount of drawdown in a well can be estimated for a given pumping rate. For example, if a 100 gpm rate is desired from a water-bearing material composed of fine sand and having an estimated specific capacity of 5 gpm/ft, then approximately 20 ft of drawdown would be required (100 gpm divided by 5 gpm/ft).

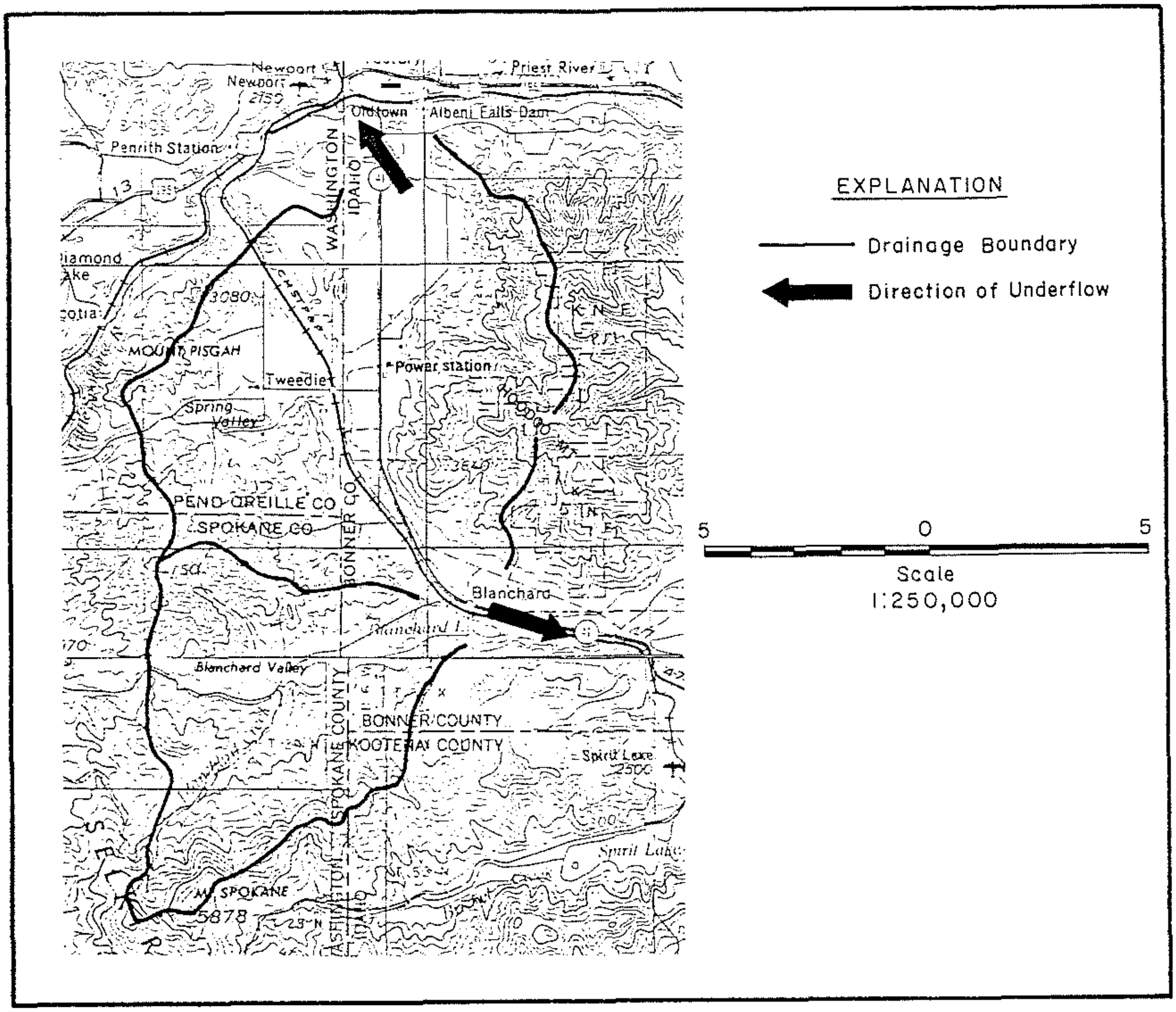

Figure 2. Approximate Extent of the Hydrologic System in the Blanchard - Oldtown Area.

The source of all water that enters the hydrologic system (shown on Figure 2) is from rain and snow fall. Mean annual precipitation ranges from about 25 inches in the lower elevations to greater than 40 inches in the higher elevations. About 60 percent of the precipitation falls as snow during the winter months. Since essentially no surface water leaves the drainage basin, all unconsumed water eventually becomes ground water. This can occur through direct infiltration of precipitation into the fractured bedrock in the highlands or porous sediment in the lowlands. However, most runoff is probably concentrated at the headwaters of the various drainages because of the predominance of impervious bedrock. As the runoff enters the lowlands, it may rapidly penetrate the permeable soils present, or be temporarily retained in lakes and sloughs, as are common in the area south of Tweedie, Washington.

A generalized water-table map was constructed of the Blanchard-Oldtown area (shown on Figure 1) from water-level measurements made during a field visit May 11-13, 1987. Water levels reported by drillers were used as a general aid where measured data was lacking. The configuration of the buried bedrock surface (described earlier) also assisted in the map construction. A list of these wells including pertinent information about them is presented in Table 1.

The shape of the water table reflects a subdued replica of the buried bedrock surface previously described. Along the margins of the valley, the slope of the water table is steep and indicative of the restricted flow conditions within the fractured bedrock. The two buried bedrock ridges show a similar, but slightly reduced effect on the flow system. As ground water encounters the permeable sediments that fill the valley, the hydraulic gradient abruptly flattens.

In the vicinity of Section 7, Township 55 North, Range 5 West an apparent ground-water divide occurs. North of the divide, ground water flows northwesterly towards Oldtown and eventually issues as springs and seeps in the Pend Oreille Valley. South of the divide, ground water flows southwesterly and apparently merges with underflow leaving Spring Valley and the tributary bedrock valley in Washington. This combined flow continues southward towards Blanchard, and then beyond to ultimately join the main flow system in Rathdrum Prairie.

A perched water body is thought to exist in the northern part of the area (shown in Figure 1). Because of the presence of glacial till of low permeability below an altitude of about 2,250 feet, ground water is temporarily retained in the overlying coarse outwash, creating a perched aquifer. Water not removed by pumpage or discharged into the Pend Oreille Valley, eventually reaches the main water table through vertical leakage. Wells completed in the perched aquifer are for domestic uses and have reported discharges of 10 gpm or less.

Historic water-level trends in the area are essentially unknown. Three of the wells visited in May 1987 were measured by the U.S. *Geological Survey (USGS) in August 1977, but provide extremely* limited information. Wells 54N-5W-18AAA1 and 56N-6W-36AAA1 both show net declines over the ten year period. The declines range from over 4 feet to almost 9 feet, respectively. The third well, 55N-6W-1DDD1 indicates a net rise of greater than 12 feet for the ten year period. Many conditions could have influenced the apparent rise or fall of the water table in these areas, however, changes in the amount of ground water that is withdrawn and variations in the amount of water that annually enters the hydrologic system probably have the greatest areal impact.

As of September 1987, the USGS added wells 54N-5W-18AAA1 and 55N-6W-24DDB1 to their statewide observation well network. These wells will be measured bimonthly and will provide a base for establishing future water-level trends in the area. Interpretations from these measurements will be included in a future addendum to this report.

Table 1. Records of Wells

Altitude of land surface: From U.S. Geological Survey topographic maps; datum is mean sea level.

Well depth: Reported, in feet below land surface.

Casing/Depth: Bottom of casing or first well opening, in feet below land surface.

Well finish: O - Open end, P - Perforated, S - Screen, X - Open hole.

Aquifer: A - Alluvium, B - Bedrock, P - Perched.

Water level/Depth: Measured, in feet below land surface.

Water level/Altitude: In feet above mean sea level.

Use of water: H - Domestic, I - Irrigation, U - Unused.

Notation: * - Not visited during May 1987 field trip.
-- = No data available.

Well Number	Altitude of land surface (feet)	Well depth (feet)	Casing: Diameter (inches)	Casing: Depth (feet)	Well finish	Aquifer	Water Level: Depth (feet)	Water Level: Date measured	Water Level: Altitude (feet)	Reported discharge (gal/min)	Use of water	Date of well completion
						Idaho						
54N-5W- 6BBA1	2360	360	6	75	X	B	58.5	5-12-87	2301	3	H	9-77
7CCD1	2245	120	12	99	S	A	65.4	5-12-87	2180	1800	I	1-78
18AAA1	2280	146	6	138	P	A	114.0	5-11-87	2166	22	H	4-73
							109.6	8-23-77				
20ACD1	2265	140	6	125	P	A	85.2	5-13-87	2180	40-50	H/I	8-77
54N-6W- 1AD1*	2300	200	10	180	S	A	146	2-81	2154	30	I	2-81
12ABC1	2268	206	12	172	P	A	94.0	5-12-87	2174	1000	U	9-68
55N-5W- 6AAD1	2230	--	6	--	--	P	36.9	5-12-87	2263	--	H	--
6BB1*	2380	132	6	126	S	P	107	7-86	2273	7	H	7-86
6CD1*	2355	111	6	102	S	P	88	5-79	2267	10	H	5-79
8DBC1	2295	180	6	64	X	B	47.0	5-12-87	2248	8	H	9-85
18DBD1	2305	49	6	44	S	A?	35.0	5-13-87	2270	10	H	9-77
19CBD1	2290	189	14	138	P	A	114.5	5-11-87	2175	1080	I	9-65
							130.1	8-23-87				
30CC1*	2355	182	6	182	O	A	90	5-82	2265	15-20	H	5-82
55N-6W- 1AD1*	2390	270	6	115	P	P/A	100	3-81	2290	10	H	3-81
1BDC1*	2410	525	6	400	P	B	170	8-86	2240	2-4	H	8-86
1DDD1	2375	210	6	207	X	A	161.7	5-12-87	2213	6	H	--
							174.3	8-11-77				
12AD1*	2370	120	6	115	S	P	103	3-78	2267	10	H	3-78
12DDC1*	2355	120	6	101	S	P	81	1-86	2274	--	H	1-86
13ADB1	2365	192	6	187	S	A	164.3	5-12-87	2201	10	H	7-77
13CDC1	2315	--	6	--	--	A?	135.7	5-13-87	2179	--	H	--
24DDB1	2275	171	16	143	S	A	100.2	5-11-87	2175	330	U	11-67
25CBB1	2340	211	6	206	S	A	163.4	5-12-87	2177	10	H	3-83
56N-5W-30DAB1	2225	260	6	--	--	B	42.0	5-12-87	2183	--	H	--
31DAA1*	2290	60	6	60	O	A?	45	8-82	2245	20+	H	8-82

Table 1. Records of Wells
(continued)

Well Number	Altitude of land surface (feet)	Well depth (feet)	Casing		Well Finish	Aquifer	Water Level			Reported discharge (gal/min)	Use of water	Date of well completion
			Diameter (inches)	Depth (feet)			Depth (feet)	Date measured	Altitude (feet)			
						Idaho						
56N-6W-25CAC1	2310	362	6	328	X	B	247.3	5-12-87	2063	8	H	1-83
36AAA1	2300	80	6	--	--	P	57.4	5-11-87	2243	--	H	--
							48.7	8-23-77				
36ABA1*	2300	271	8	266	S	A	190	5-78	2110	--	I	5-78
						Washington						
30N-45E- 2CA1*	2280	59	6	54	S	A	33	5-84	2247	--	H	5-84
11DBC*	2330	260	6	123	X	B	150	5-84	2180	0.5	H	5-84
23CAA1*	2355	138	6	120	P/S	A	108	4-87	2247	--	H	4-87
24AA1*	2275	140	6	140	O	A	121	8-79	2154	--	H	8-79
31N-45E-24ABD1*	2160	175	8	77	S/O	A	48	8-73	2112	50	I	8-73
31N-46E-30DD1*	2360	150	6	141	S	A?	120	3-81	2240	51	H	3-81

Water Budget

An estimate of the water yield for the drainage area shown on Figure 2 was derived using the following approach. Stream flow measurements in Blanchard Creek for the period 1980-85 (excluding the 1983 calendar year) indicated an average total annual flow of 15,000 acre-feet. With a drainage area of about 20,000 acres, an average water yield of 9 inches per year was computed. Since a larger proportion of the drainage area between Blanchard and Oldtown is at lower elevations than occurs in Blanchard Valley, a much lower water yield is to be expected. Based on a relative comparison between the shape of each drainage basin, an average water yield of 5 inches per year was considered reasonable for the Blanchard-Oldtown area. With a drainage area of about 43,000 acres, an average annual water yield of 18,000 acre-feet was derived.

According to the water rights that have been filed in the Blanchard-Oldtown area, the total irrigated land includes about 1,700 acres. About 60 percent of this acreage occurs in the valley from Blanchard to about three miles to the northwest, and another 30 percent lies in the area northeast of Tweedie, Washington. Assuming an average consumptive rate of two acre-feet per year per acre for the crops grown in the area, the annual consumptive use from irrigation is about 3,400 acre-feet. With the remaining domestic and stock uses included, the total consumptive use for the area may approach 4,000 acre-feet per year. This estimate does not take into account any consumptive use that occurs from development across the state border in Washington.

When comparing the total consumptive use to the total water yield of the drainage area, the concern over water shortage appears to be erroneous. However, it should be noted that the water resources of the entire area are not evenly distributed. As a result, the extent of development that can occur in an area without having adverse affects is largely controlled by the local hydrologic conditions. One area that offers potential for increased development lies within the valley between Tweedie, Washington and Blanchard. This area appears favorable because of the predominance of highly permeable sands and gravels present and since it receives additional underflow from the apparent convergence of ground-water flow near Tweedie.

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