

Camas Prairie Monitoring Well Installation Completion Report

Alex Moody
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ITB 23-03, Contract No CON01677

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Introduction

Drilling of new monitoring wells on the Camas Prairie of central Idaho was completed as the Idaho Department of Water Resources' (IDWR) portion of a four-year hydrologic investigation jointly funded by the Idaho Water Resource Board and the US Geological Survey to update the characterization of water resources in the Camas Prairie and Magic Reservoir. Previous comprehensive hydrogeological studies in the basin were conducted by Walton (1962) and Young (1978). The Camas Prairie Groundwater Users Association had requested renewed studies in the Camas basin in response to more recent work in the Wood River Valley aquifer, which is also a part of the Big Wood Groundwater Management Area.

Drilling services were sought with an invitation to bid that was awarded to Cold Steel Drilling through IDWR contract CON01677. Wells were drilled mainly in spring 2024, with an additional well re-drilled in December 2024. See [Table 1](#) for general information about well construction.

Well locations were chosen based on their ability to fill spatial data gaps in the existing IDWR groundwater monitoring network, especially on Macon Flats, a brushy basalt flat west of Magic Reservoir containing only sparse stock wells, and a few miles northwest of the town of Fairfield, an area of surface water irrigation with minimal groundwater wells. Locations can be seen in [Figure 1](#).

The USGS conducted borehole geophysics in wells C1, C2, and C4 after completion of drilling and documented the results in Zingre and Twining (2025).

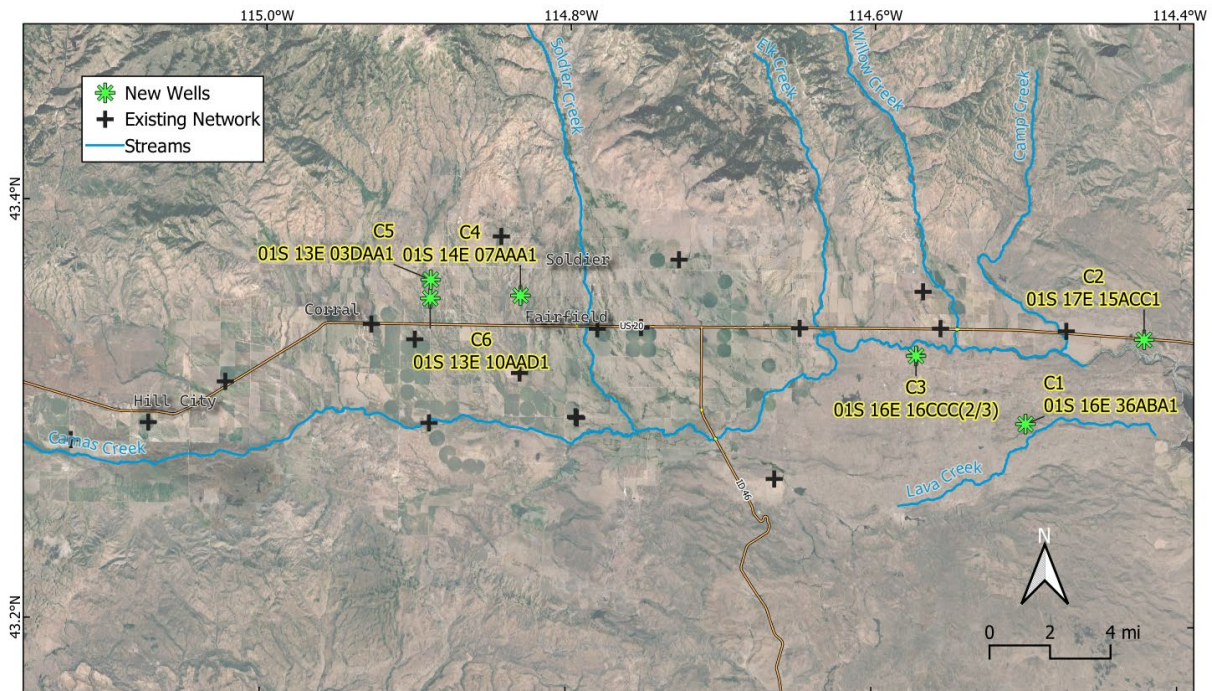


Figure 1: Map of locations of the six monitoring wells drilled during the project and the wells currently measured by IDWR.

Well Construction and Lithology

IDWR staff was present during drilling operations for oversight and to collect and log cuttings. The nature of the dual-rotary drilling method allows casing to be driven simultaneously with drilling and allows for nearly continuous returns. Cuttings were sampled approximately every five feet. Collection depths were estimated using the position of the driver relative to landmarks on the rig, which is an uncertain method that can mislocate marked depths by several feet.

The lithologic descriptions below use a combination of staff observations and driller logs to detail a general sense of lithology in each borehole. Colors were reinterpreted from dry cuttings using the Munsell color system. [Figure 3](#) shows examples of collected drill cuttings.

Table 1: Well completion summary table

Well Name	Metal Tag	Completion Date	PLS/Station Name	Completed Depth (ft below ground surface)
C1	D104217	4/8/2024	01S 16E 36ABA1	300
C2	D104218	4/15/2024	01S 17E 15ACC1	355
C3	D104219	5/4/2024	01S 16E 16CCC(2/3)	310
C4	D104220	5/8/2024	01S 14E 07AAA1	500
C5	D104221	5/3/2024	01S 13E 03DAA1	311
C6	D104652	12/19/2024	01S 13E 10AAD1	294

C1: 01S 16E 36ABA1

Well C1 is located on Macon Flats down a powerline access road that turns south from Macon Flats Road Road. C1 allows for measurements in the center of Macon Flats and replaces a handful of measurements taken at a difficult-to-measure stock well further south along the access road. C1 is near the southeastern edge of the Camas Creek drainage near the divide with Lava Creek.

The borehole is 300 feet deep and consists of 257 feet of basalt with approximately eight reddish brown interflow zones representing separate flow tops. The thickest basalt flow sequences are at the top and bottom of the basalt zone. Underneath the basalt are sediment sequences of various grain sizes. The uppermost sediments are about ten feet of coarse grayish yellow sands transitioning to interbedded clays and sands with a noticeably more greenish coloration.

Water bearing zones are located in the reddish-brown basalt interflow zones and the non-clay sediments. Six-inch steel casing was set to 300 feet and perforated from 250 to 255 feet. A 60-foot bentonite seal was placed from the surface down (see [Figure 4](#)).

Water levels in C1 fluctuate 2.4 feet annually and peak in mid May ([Figure 2 \(a\)](#)).

C2: 01S 17E 15ACC1

The siting of well C2 ran into various hurdles during the project. The initial land access process through the Bureau of Land Management had not reached completion by the start of drilling and a new location had to be found while other wells were being drilled. An attempt was made to locate the well on private land within Macon Flats but were unsuccessful in agreeing on a location that would work for IDWR, the driller, and the landowner. The final location of well C2 was an Idaho Fish and Game access site that provided for an efficient land access process. This site is on the north side of Camas Creek between Poison Creek and Barrel Springs, 500 yards from Magic Reservoir.

Construction of C2 consists of six-inch casing to 320 feet, a PVC liner from 295 to 315 ft, and a PVC screen from 315 to 355 feet (see [Figure 5](#)).

Well C2 mostly passes through alternating layers of fine and coarse sediments after passing through a 15 to 20-foot layer of basalt closer to the surface. Beneath the basalt are alternating sequences of grayish yellow or light olive gray and blue sands, clays, and gravels exhibiting different rates of fining or coarsening with depth. From 230 feet to 360 feet is a large sequence of yellow-orange hued sediments, which is not seen at depth in C4, C5, or C6, which tend to have green-blue hued sediments.

A thin layer of drill cuttings below the basalt are tuffaceous with black phenocrysts and could potentially be related to the tuff of Poison Creek mapped by Kauffman et al. (2007).

Water levels in C2 fluctuate 2.15 annually and peak in late May ([Figure 2 \(b\)](#)).

C3: 01S 16E 16CCC(2/3)

Well C3 is located on State of Idaho land 13 miles east of Fairfield between Camas Creek and Macon Flats Road. Camas Creek is about 1,600 ft to the north of the well. The parcel has a grazing lease with a shallower stock well that IDWR measures manually. The location provides a monitoring location to help define lateral water levels on Macon Flats and potential vertical gradients near Camas Creek.

C3 is drilled to 310 feet and cased to 188 feet with six-inch steel casing. There are two screened intervals at 192 to 202 feet and 300 to 310 feet separated with a K-packer, which allows the basalt and sand unit water levels to be measured separately. Measurement stations in the basalt and sand intervals are 01S 16E 16CCC2 and 01S 16E 16CCC3, respectively. Each interval has a separate 1.5-inch PVC liner (see [Figure 6](#)). The decision to set two intervals was made during drilling after encountering the bottom of the basalt.

Borehole lithology of C3 is layered basalt flows with several identifiable flow tops from 0 to 218 ft underlain by interbedded clay, sands, and gravels to 310 feet. The basalts range from black to reddish-brown with occasionally clay streaks and secondary-mineralization and variation in vesicle size. Reddish-brown vesicular sections are thought to be flow tops and coincide with water-bearing zones as noted by the driller. The sediment sequences exhibit trends in grain size reflecting changing depositional environments. For example, the first sequence below the basalts shows a fining downward trend (sand to clay) from 218 to 226 ft and then a coarsening sequence up to small-medium pebbles from 226 to 233 ft. This then abruptly changes to clays at 233 ft. Sequences without clay are water-bearing.

Water levels fluctuate 4.02 and 1.98 feet in the shallow and deep intervals, respectively. The shallow interval peaked in mid-April and the deep interval peaked in mid-May, though both broad peaks that span several weeks ([Figure 2 \(c\)](#))

C4: 01S 14E 07AAA1

Well C4 is two miles northwest of Fairfield on private dryland farm land near the intersection of roads 100 North and 200 West. C4 is the deepest well drilled during the project and provides a record of deep sediments and water levels near the center of the Camas Prairie. The nearest active wells in the IDWR network all at least two miles away in all directions.

Drilled to 500 feet, C4 is cased with six-inch steel casing to 480 feet, lined from 460 to 480 with 4.5-inch PVC and screened from 480 to 500 feet with manufactured Certa-lok PVC screen (see [Figure 7](#)).

The lithology consists of alternating sequences of moderately to poorly sorted clays, sands, and granule to pebble sized gravels. There are identifiable trends in grain sizes and coloration with depth. From 0 to 93 feet is a yellowish gray sequence, followed by pale blues and greens to 335 feet. 335 to 445 feet is yellowish gray with a lens of greenish gray clays and sands. 445 to 503 feet is a light greenish gray. Organic charcoal material was found between 117 to 130 feet in light green clayey sands.

Water levels fluctuate 18.76 feet annually and peaked in very early June ([Figure 2 \(d\)](#)). Gaps in the hydrograph occurred when water levels fell below the depth of the datalogger.

C5: 01S 13E 03DAA1

Well C5 is located on private farmland in an area with little groundwater irrigation and thus fewer deep wells than other areas of the Camas Prairie. The chosen location will fill a gap in water level information from the lower aquifers. The borehole was drilled to 311 feet, cased with six-inch steel casing to 294 feet, and screened with stainless wire wound from 294 to 309 feet (see [Figure 8](#)). Due to issues with county road easements, well C5 was abandoned about six weeks after completion and decommissioned according to Idaho statute.

Borehole lithology in C5 is entirely interbedded clay, sand, and gravel alluvial and lacustrine sediments with noticeable gradations in grain size and color with depth. A yellowish gray hue dominates down to 151 as sediments fine and coarsen. Greens and pale blues between 151 feet and 244 where sediments are mostly clays and sandy clays. From 244 to the bottom at 315 is coarser yellowish tan sediments with minor clay.

Water levels dropped approximately two feet in June 2024 during the short period where water levels were measured ([Figure 2 \(e\)](#)).

C6: 01S 13E 10AAD1

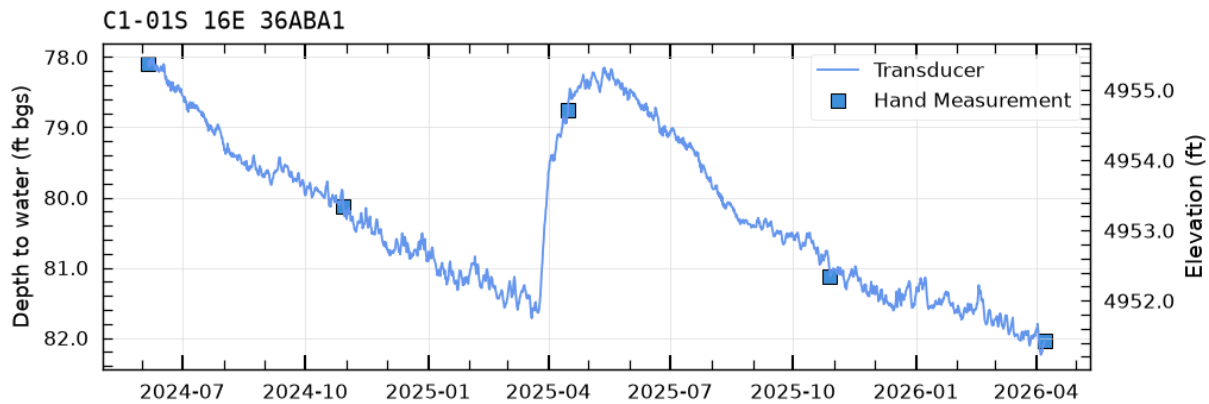
Well C6 was drilled to replace the abandoned well C5. C6 is located one thousand yards south of the former C5 well site along 500 West and is 50 feet from Threemile Creek. Six-inch steel casing extends to 283 feet with a 5-inch stainless steel wire wound screen from 283 to 293 feet (see [Figure 9](#)).

C6 lithology is again unconsolidated and alternating sand, clay, and gravel sediments. Coarser yellowish sediments dominate in the top 45 feet, underlain by a predominantly clay layer from 47 to 95 feet. Clays and sands alternate from 95 to 220 and change from gray and greenish blue gray with depth. Water is present in the sandy layers. Gravels below the alternating sand and clay fine to clays and sands until the bottom of the borehole, also hosting water.

Water levels fluctuate 23.6 feet annually and peak around end of May (*Figure 2 (f)*).

Hydrographs

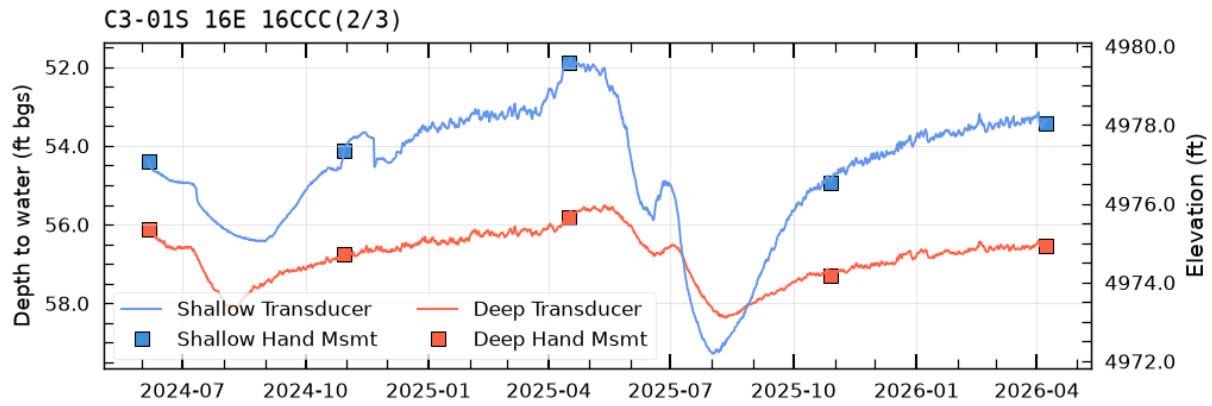
IDWR staff installed In-situ LevelTROLL dataloggers in all new monitoring wells. Initial hydrographs for the first two years are shown in *Figure 2*.



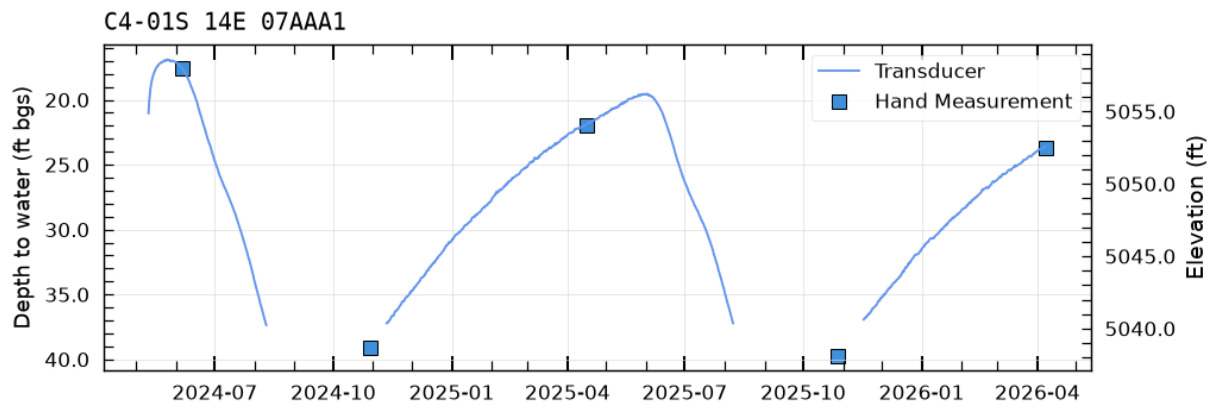
(a)



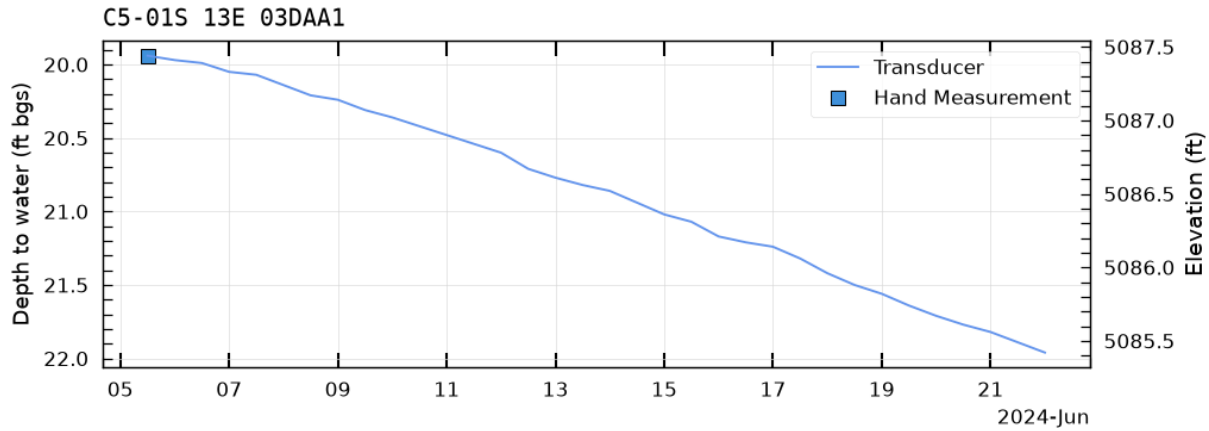
(b)



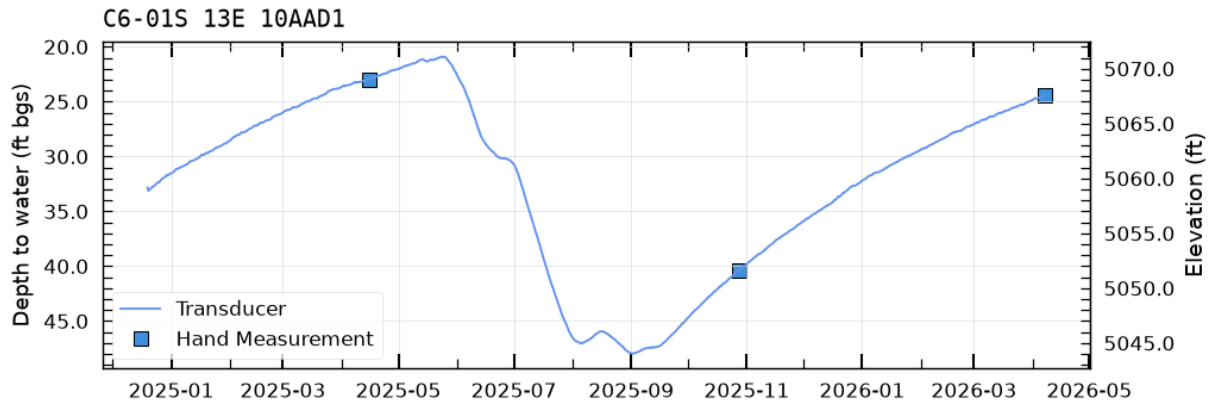
(c)



(d)



(e)



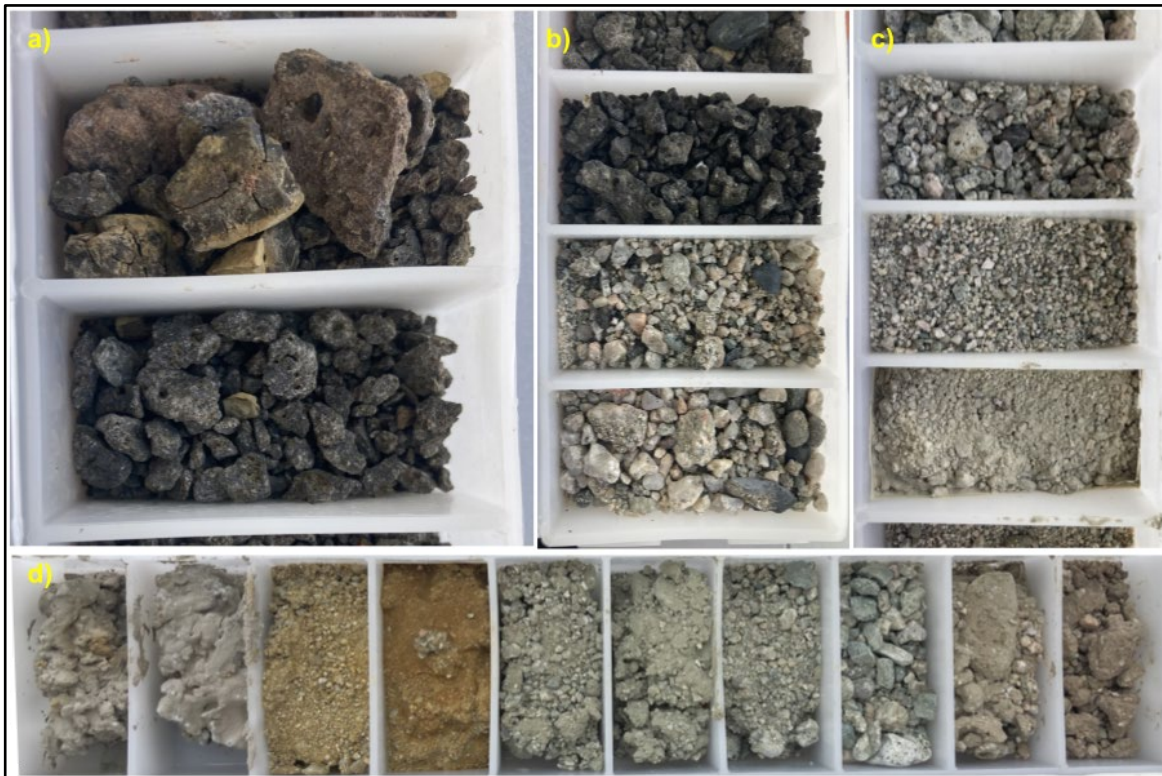
(f)

Figure 2: Groundwater-level hydrographs in the Camas drilling project wells through spring 2026.

Discussion

Lithologies of C2, C4, C5, and C6 reflect the alluvial and lacustrine origins of the Camas Prairie aquifer system. Sands and gravels make up the water-bearing units, while clays act as aquitards between shallow and deep confined aquifers. The upper 40 feet of the alluvial wells represent the unconfined aquifer. There are at least two lower aquifers of interbedded sand and gravel separated by significant clay layers that stand out in the drill cuttings. This hydrogeology is consistent with previous work (Walton (1962), Young (1978)).

Wells C1 and C3 document an aquifer partially occurring in the interflow zones of the basalt of Macon Flats. C2 has a thin layer of basalt that represents the edge of the same basalt flow on Macon Flats. Kauffman et al. (2007) note an approximate edge of the basalt flows where C2 is located. Sediments located below the basalt in these wells also contain water in the coarser sediment layers. There is no evidence to suggest that the basalt and sediments host different aquifers, though the black and gray basalt tended to not have water and could potentially act as a barrier to vertical flow barring the presence of permeable vertical fractures from basalt columns. Well C3 water levels show a vertical differential that could induce downward flow if there are vertical fractures in the basalt.



*Figure 3: Drilling cutting samples in collection trays. Each compartment is 2 inches by 1 inch. **a)** Reddish brown basalt and greyish black basalt transition in well C1. **b)** Basalt to sediment transition in well C1. **c)** Sediment grain size gradation from granules to clayey sand in C6. **d)** Grain size and color variety in C4 from 300 feet to 340 feet.*

References

Kauffman, John D, Kurt L Othberg, Theresa A Taylor, and Jane S Freed. 2007. *Geologic Map of the Magic Reservoir West Quadrangle, Blaine and Camas Counties, Idaho*. Idaho Geological Survey.

Walton, William C. 1962. *Ground-Water Resources of Camas Prairie, Camas and Elmore Counties, Idaho*. <https://doi.org/10.3133/wsp1609>.

Young, Harold William. 1978. *Water Resources of Camas Prairie, South-Central Idaho*. 78-82. <https://doi.org/10.3133/wri7882>.

Zingre, Jeffrey A, and Brian V Twining. 2025. "Geophysical and Video Logs of Eight Wells in the Camas Prairie, Idaho." *US Geological Survey (USGS) Data Release*, 838. <https://www.usgs.gov/data/geophysical-and-video-logs-eight-wells-camas-prairie-idaho>.

Appendix: Well Construction and Lithology Diagrams

Well construction and lithology diagrams were constructed to reflect the as-built construction and the lithologies logged from cuttings. The table below is a dictionary of description abbreviations used in the diagrams.

Category	Full	Abbreviation
Materials	basalt	bslt
	sand	snd
	clay	cly
	gravel	grvl
	granules	gran
	pebbles	peb
	silt	slt
Modifiers	sandy	sndy
	clayey	clyey
	silty	slty
	gravelly	grvly
Grain size	very coarse	v.crs
	coarse	crs
	medium	med
	fine	fn
Colors	black	blk
	brown	brn
	gray	gy
	green	grn
	orange	or
Structure	yellow	yel
	vesiculated	vesic
	broken	brkn
	cemented	cmtd
	streaks	strk
	seams	seam
	inclusions	incl
	sticky	stky

Well C1

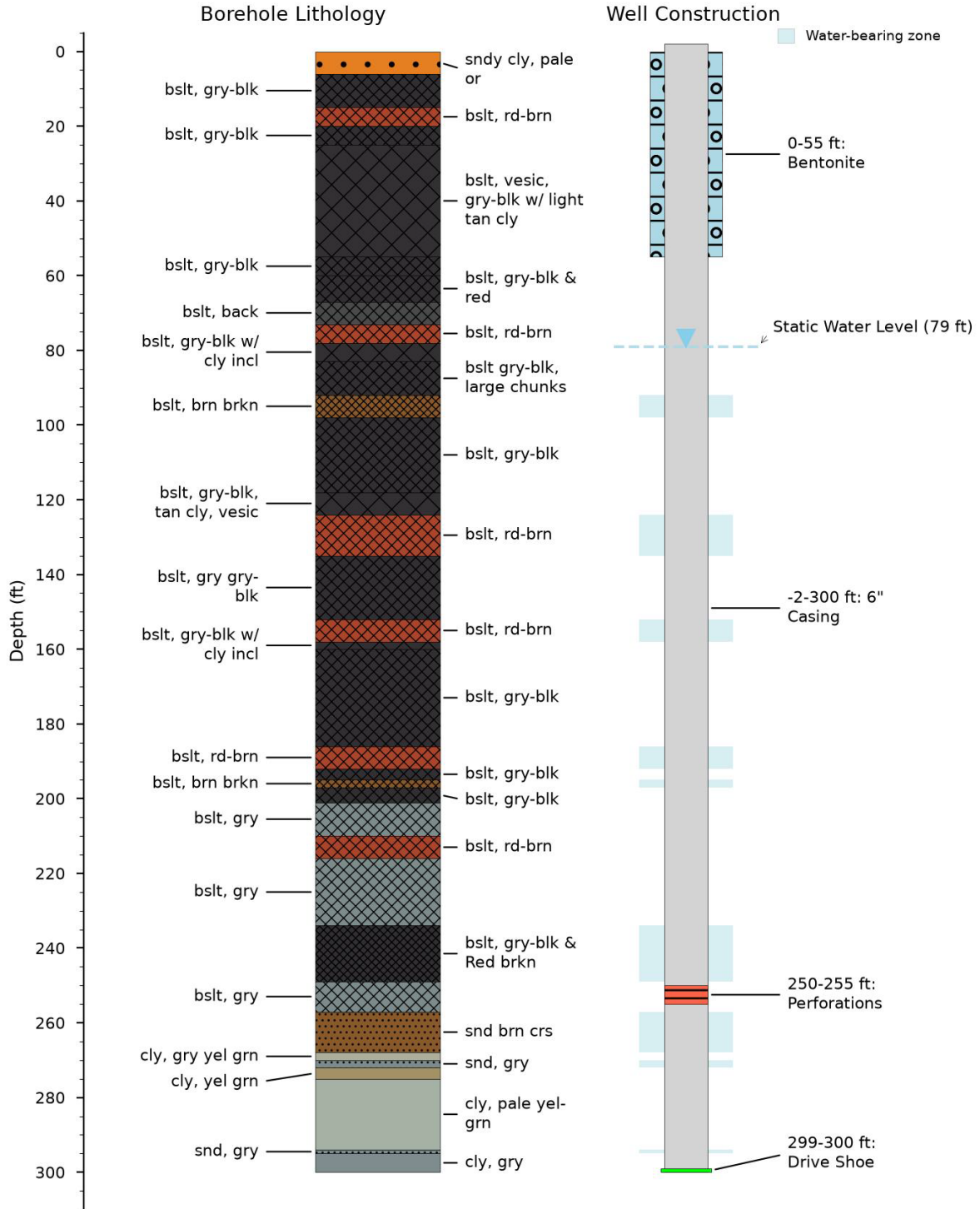


Figure 4

Well C2

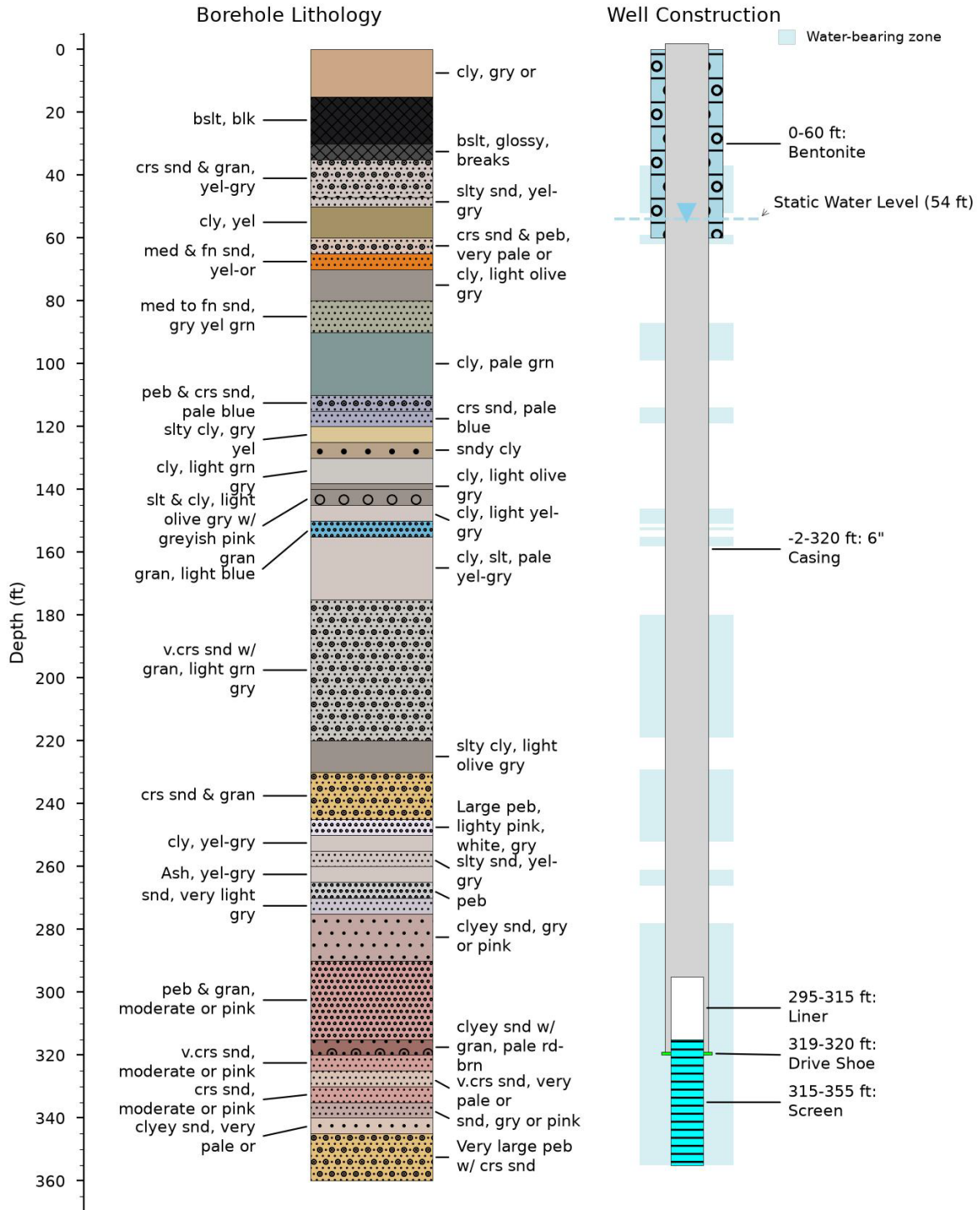


Figure 5

Well C3

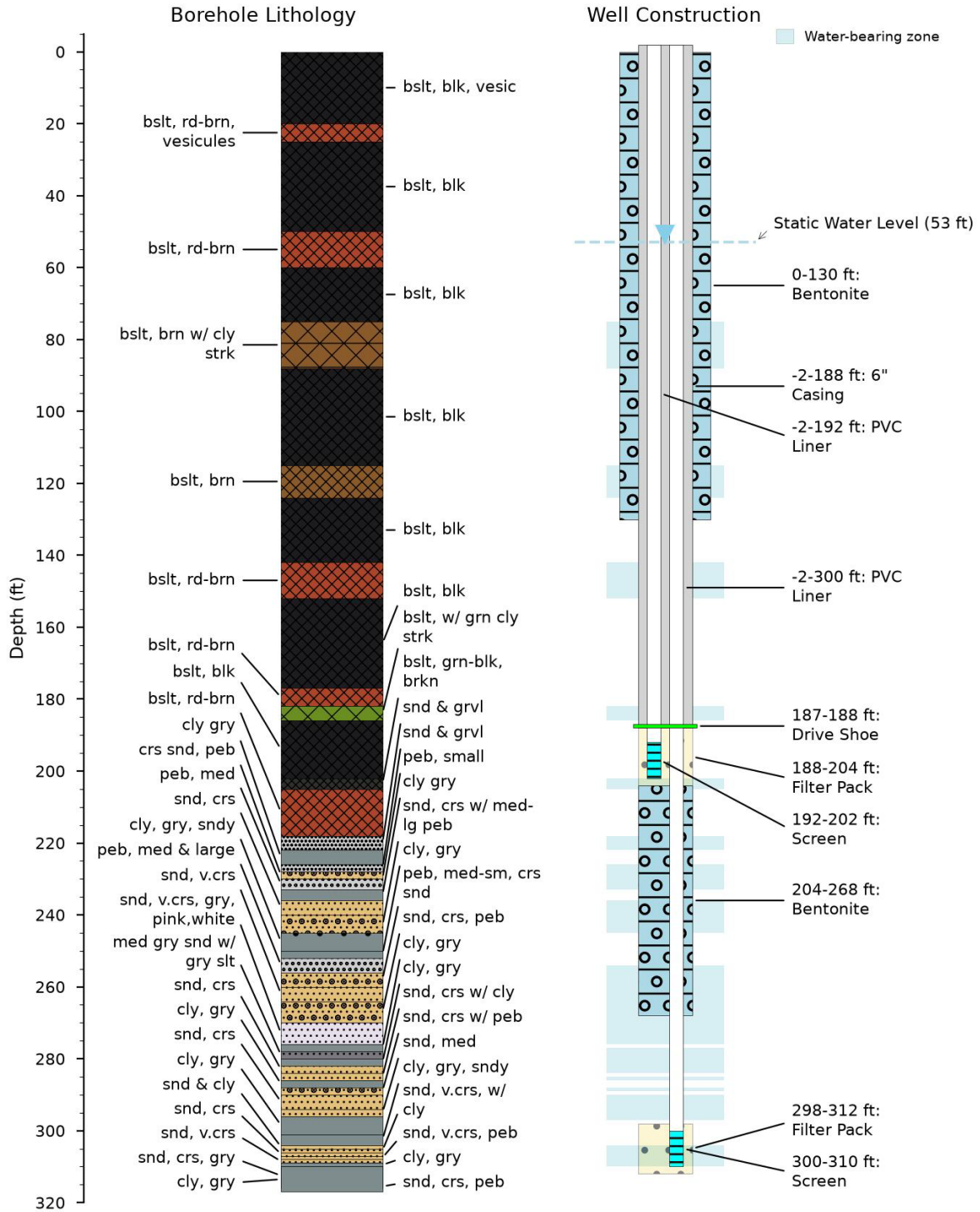


Figure 6

Well C4

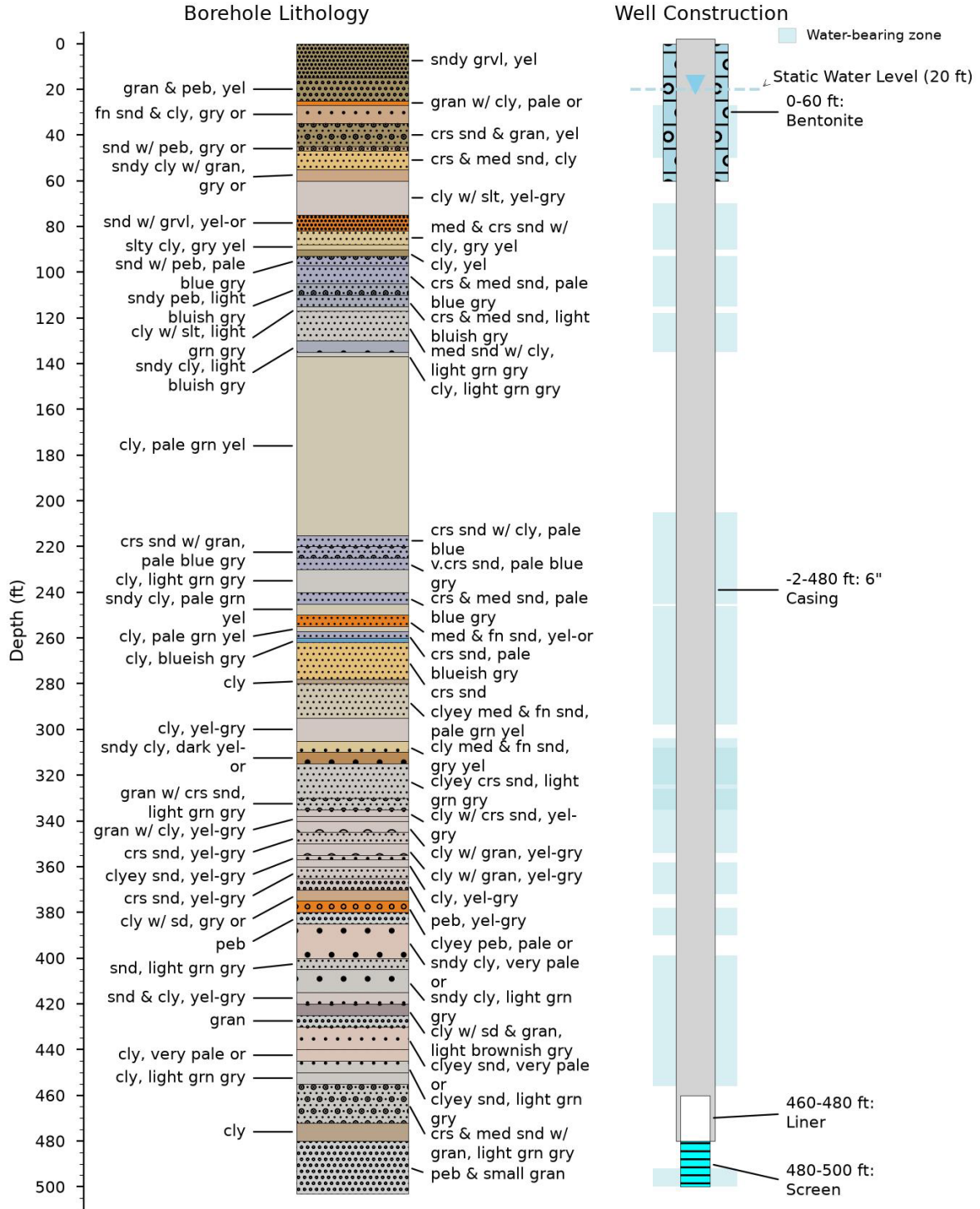


Figure 7

Well C5

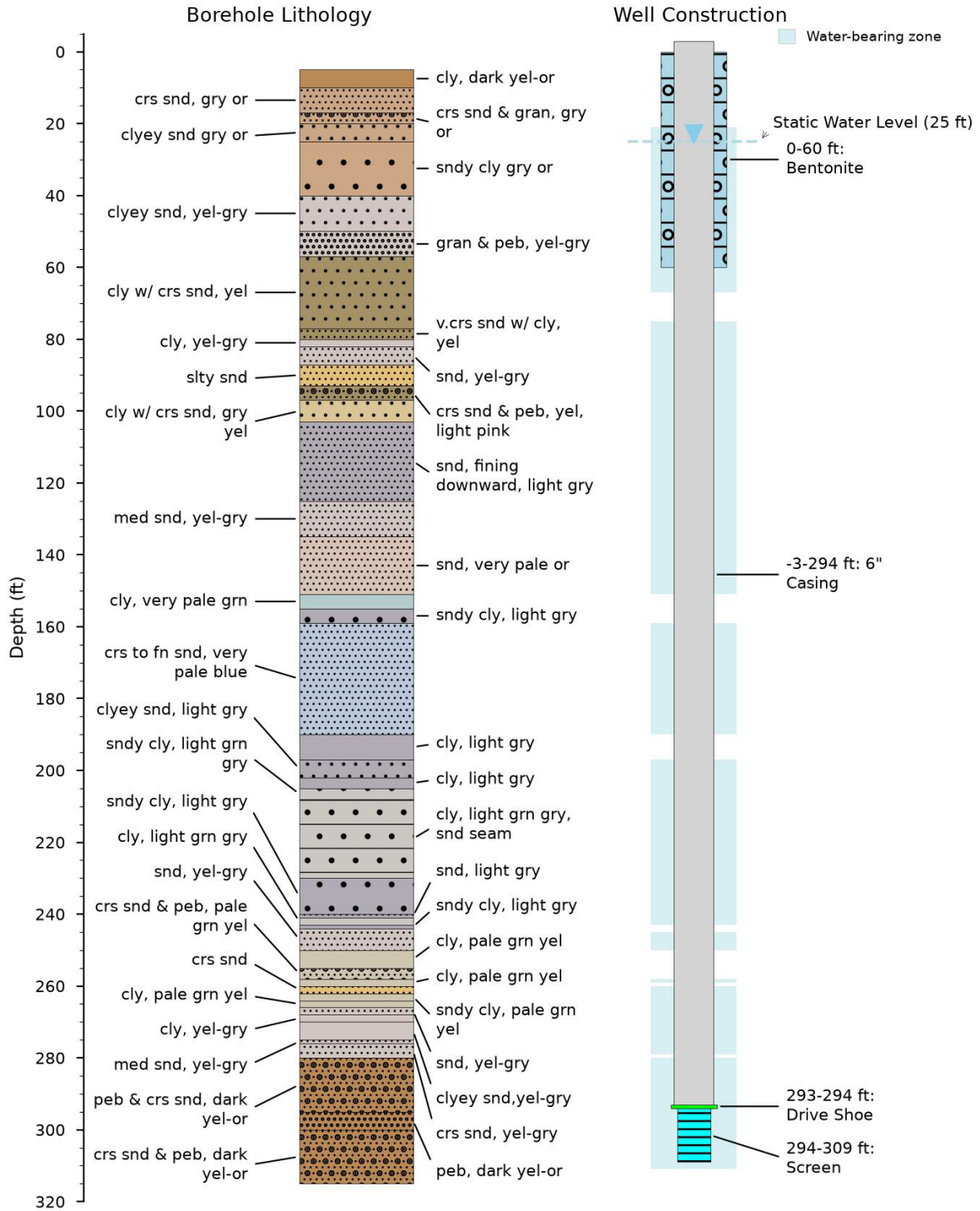


Figure 8

Well C6

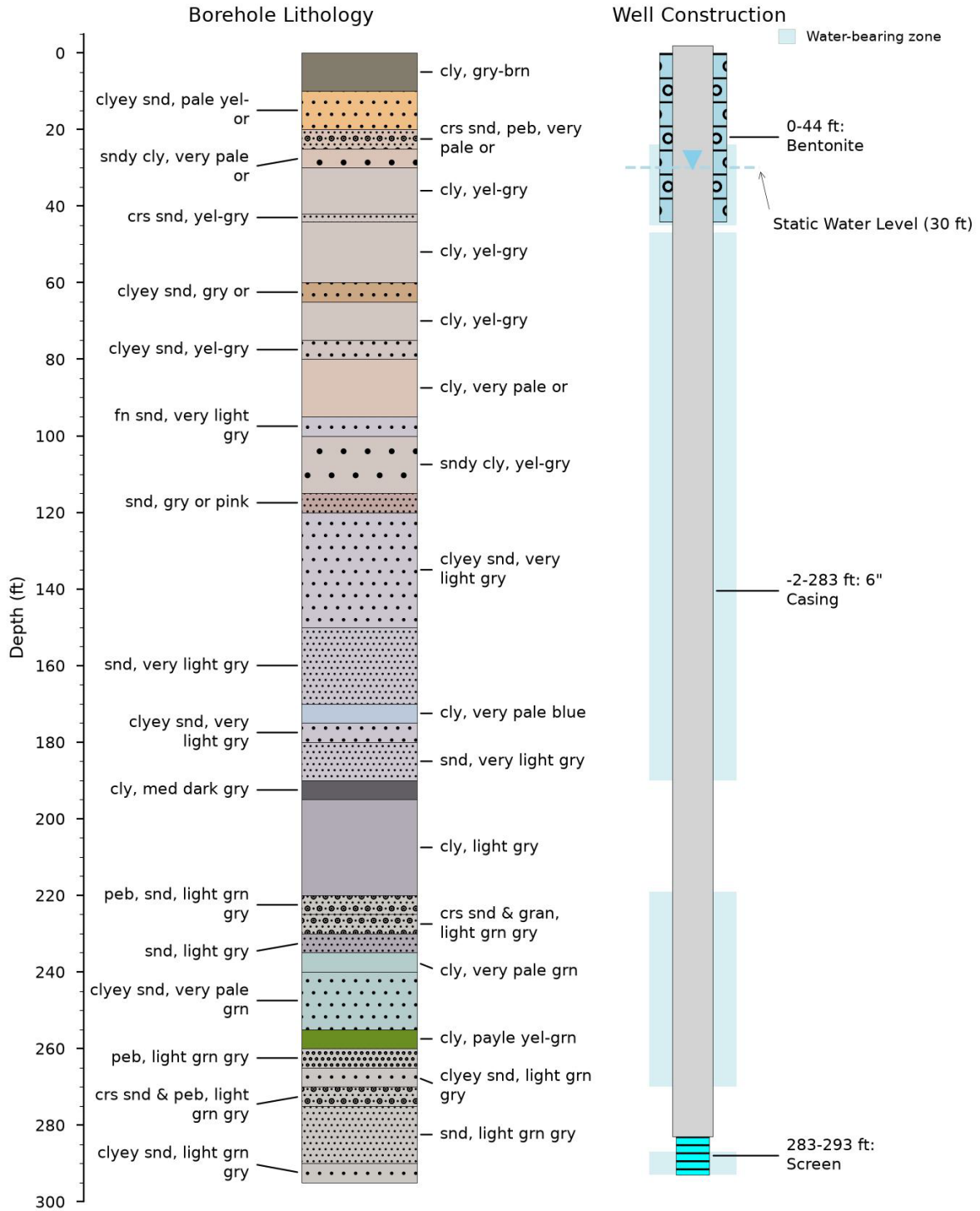


Figure 9