APPENDIX E
NMR LOGGING RESULTS

APPENDIX E: NMR LOGGING RESULTS

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E.1 INTRODUCTION

This appendix describes the results of nuclear magnetic resonance (NMR) logging performed as part of the Remedial Investigation (RI) at the Nevada Environmental Response Trust ("NERT" or "Trust") Site located in Henderson, Nevada (the "Site"). The NMR scope of work, submitted to the Nevada Division of Environmental Protection (NDEP) in May 2018 as RI Phase 3 Modification No. 3 proposed logging 155 well locations within Operable Unit 1 (OU-1), Operable Unit 2 (OU-2), and Operable Unit 3 (OU-3). To date, 150 wells have been logged as part of the RI for OU-1/OU-2, with an additional 118 wells logged for the Downgradient Study Area Investigation and treatability/pilot studies. Field procedures that were used for the NMR investigation are described in Appendix B-1. The locations of wells where NMR logging has been performed as part of the OU-1/OU-2 RI are provided in Figures E-1 through E-3 and listed in Table E-1. Locations for wells logged as part of the Downgradient Investigation, Galleria Drive Bioremediation Treatability Study, Las Vegas Wash Bioremediation Pilot Study, Seep Well Field Area Bioremediation Treatability Study, and the Unit 4 In-Situ Bioremediation Treatability Study are provided in Figure E-4 and listed in Table E-2.

NMR is a geophysical technique that enables the in-situ estimation of porosity, pore-size distribution, and hydraulic conductivity in the vicinity of a well using an instrument placed within the well casing. NMR has been used for many years in the petroleum industry to estimate the porosity and permeability of deep subsurface reservoirs. More recently, it has been applied to environmental investigations following the development of a slimline instrument that can be used in boreholes with smaller diameters (Behroozmand et al. 2014). The NMR logging at the NERT Site was conducted using the Javelin NMR instrumentation developed by Vista Clara Inc.

The purpose of the NMR investigation was to obtain additional information on subsurface hydraulic properties to help identify potential continuous coarser-grained flow pathways within the saturated alluvium and the Upper Muddy Creek formation (UMCf). In addition, the results of the NMR study have been incorporated into the stratigraphic analysis of the Site (Section 4 of main report). An evaluation of sequence stratigraphy within the NERT RI Study Area will be included in the RI Report for OU-3.

The hydraulic properties that can be estimated using NMR include effective porosity, total porosity, and hydraulic conductivity. Effective porosity, which is the portion of pore space that contains mobile water contributing to groundwater flow, is an important parameter for modeling groundwater flow and contaminant transport. Total porosity, which includes effective porosity plus "bound" pore space where water is immobile (i.e., dead-end pores, small pores that retain water by capillary pressure, or water bound to clay particles), is an important parameter for estimating contaminant mass (which was used in the mass estimate described in Appendix N). Hydraulic conductivity is an important parameter for modeling groundwater flow and contaminant transport. The accuracy of the NMR estimates of these hydraulic properties are evaluated in this appendix.

E.2 NMR LOGGING

E.2.1 Analysis Methods

NMR is a geophysical technique that is sensitive to formation water content and pore structure in the vicinity of the well casing. The physical property measured by NMR is the magnetic spin of the hydrogen protons in water molecules. A magnetic field is applied by the NMR instrument which perturbs the spins of the protons, and then the time it takes for the spins to return to equilibrium is measured. This time, called the relaxation time, is longer for larger water-filled pores and shorter for smaller water-filled pores. Since geologic materials are heterogeneous, there is a distribution of relaxation times corresponding to the distribution of pore sizes within the geologic media. The relaxation time distribution can be used to estimate the total water-filled porosity, as well as the effective porosity which is the fraction of total porosity that is mobile (associated with larger pores).

Using the Schlumberger Doll Research (SDR) equation, the pore size distribution and porosity can be used to estimate hydraulic conductivity (Kenyon et al. 1988). The initial amplitude of the NMR signal (S_0) is used as an estimate of total porosity and the geometric mean-log relaxation time (T_{2ml}) is used to characterize the pore size distribution. The SDR equation can be used to estimate hydraulic conductivity (K_{SDR}), as shown below.

$$K_{SDR} = b_{SDR} T_{2ml}^2 S_0^N \qquad (1)$$

The SDR equation uses a calibration coefficient (b_{SDR}), which is derived from NMR logs and pump tests conducted in several unconsolidated sediment aquifer sites throughout the United States (Walsh et al. 2013). For unconsolidated materials, the coefficient used is 8,900 and the exponent value (N) is 1.

The Javelin instrument used at the Site is most sensitive to soil conditions approximately 10 to 15 inches from the well centerline, and it provides a reading at 0.5-meter intervals down the well. Attachment E-1 shows the post-processed NMR logs for each well and Figure E-5 presents an annotated NMR log with explanatory information. The logs are presented in graphs that depict the relaxation time distribution, the geometric mean of relaxation times, the mobile and total water content, and the hydraulic conductivity estimate from the SDR equation. Each of the parameters are plotted against the depth below the ground surface, in feet (Figure E-5). The graphs have been supplemented with additional field data obtained as part of the RI, including available laboratory physical test results, measured water levels, stratigraphic unit, USCS code, and estimates of hydraulic conductivity from slug testing (presented in Appendix D).

For each NMR log, the distribution of NMR relaxation times is shown in the first column from the left, with brighter colors showing a stronger signal and therefore suggesting a higher prevalence of pore spaces exhibiting that relaxation time. Signals emanating from water in smaller pore spaces have shorter relaxation times and are shifted towards the left side of the plot. Likewise, signals from larger pore spaces have longer relaxation times and are towards the right. The white line across the distribution shows the geometric mean log relaxation time. The second column shows the noise associated with the NMR log, which reflects the reliability of the data. Data below a noise level of 10% is most reliable, data between 10-20% noise can be interpreted qualitatively, and data with noise above 20% should not be used. For this investigation, data collected in the saturated zone was generally within acceptable noise limits. Although not a focus of the study, the data collected from the unsaturated zone generally had noise levels too high to be used. The estimates of mobile water content and total water content are presented in the third column, with the difference between them representing the water that is considered bound within the micropores[1]. The available total and effective porosity results from laboratory physical testing of soil samples are also included on this plot, where available.

The fourth and fifth columns indicate the stratigraphic unit and USCS soil classification (as determined from the well boring logs). For the UMCf, the stratigraphic column is shaded green to indicate a siliciclastic mudflat facies association and shaded blue to indicate a lacustrine facies association. The soil classification column is shaded grey to indicate cementation or calcified deposits. The final column shows the estimate of hydraulic conductivity from the SDR equation. Where available, hydraulic conductivity estimates from slug testing are also shown in the final column at the depths of the well screen.

The wells selected for NMR logging are shown by operable unit (OU) in Figures E-1, E-2, and E-3. A list of wells that have been logged for the OU-1/OU-2 RI and their respective depths are listed in Table E-1. Wells that have been logged for the Downgradient Study Area Investigation and treatability/pilot studies and their respective depths are listed in Table E-2. Locations that have been logged for the Downgradient Study Area Investigation and treatability/pilot studies are shown in Figure E-4.

[1] Pore water having decay time (T2) longer than 33 milliseconds (ms) is estimated to be mobile. The remaining water content is assumed to be bound within the pore spaces. Since this cutoff time was derived from oil reservoir sandstones, and not the site-specific soil types, this cutoff is considered approximate.

E.3 NMR DATA EVALUATION

The NMR investigation results have been compared with other data sources to evaluate the reliability of the NMR results. This comparison was performed for NMR estimates of hydraulic conductivity by comparing NMR estimates of hydraulic conductivity to the results of slug testing. The NMR estimates of mobile and total water content were compared to laboratory-measured effective and total porosity values. Summary statistics presented as part of the NMR data evaluation incorporate all available NMR data, including data collected as part of OU-1/OU-2 RI and the Downgradient Study Area Investigation and treatability/pilot studies.

E.3.1 Hydraulic Conductivity Estimates

Hydraulic conductivity estimates derived from NMR were compared to slug test results for wells having results from both tests. The slug testing results are presented in Appendix D. The NMR data was averaged over the same depths as the well screen interval to enable direct comparison of results. The NMR estimates of hydraulic conductivity *(K)* have been plotted against the slug test estimates per OU in Figure E-6 and per lithology in Figure E-7. If there was a perfect match between the slug test and NMR results, the points would fall along the 45-degree match line shown in the figure. The dashed lines on either side of the match line indicate differences of one order of magnitude. In general, the match is much better at conductivities greater than 1 ft/d since the points are located closer to the match line and generally within the dashed lines representing a difference of one order of magnitude.

The NMR method appears to have a lower bound sensitivity of approximately 0.1 ft/d. For wells with slug tests results at or below 0.1 ft/d, the NMR estimate is bounded at approximately 0.1 ft/d (with one exception). Therefore, the NMR method does not appear to be capable of reliably measuring low conductivities that would be associated with fine-grained sediments.

For this analysis, order of magnitude differences were calculated as the difference between the base 10 logarithmic *K* values derived from slug tests versus those derived using NMR, with a positive value indicating the NMR estimate of *K* that exceeds the slug test *K* value. The corresponding summary statistics for the differences are presented in the tables below and reflects data from all available investigations. The differences are plotted as a function of the slug test results in Figures E-8 (by operable unit) and E-9 (by lithology).

Order of Magnitude Difference in Hydraulic Conductivity Estimates (K_{NMR}-K_{slug}), per OU

Operable Unit	Count	Mean Log_{10} Difference (ft/d)	Range of Log_{10} Differences (ft/d)	Root Mean Square Log_{10} Difference (ft/d)
OU-1	42	0.3	-1.7 – 2.6	1.1
OU-2	32	0.7	-1.1 – 3.7	1.4
OU-3	106	0.4	-1.9 – 4.0	1.4

Order of Magnitude Difference in Hydraulic Conductivity Estimates (K_{NMR}-K_{slug}), per lithology

Lithology Type	Count	Mean Log_{10} Difference (ft/d)	Range of Log_{10} Differences (ft/d)	Root Mean Square Log_{10} Difference (ft/d)
Qal	84	0.5	-1.9 – 4.0	1.5
UMCf-fg	83	0.5	-1.4 – 3.7	1.2
UMCf-cg	9	0.1	-0.7 – 0.6	0.5
Bedrock	4	0.1	-0.2 – 0.4	0.2

As shown in the tables above, the NMR estimates of *K* differ from the slug test results by up to four orders of magnitude. On average, the NMR estimates tend to overestimate the values derived from slug testing. This is especially true for lower hydraulic conductivities and for wells within OU-1. Higher values of *K* from slug testing are generally underestimated by NMR, although within OU-3 the higher values are nearest to the target values. This suggests that the NMR technology is reasonably effective at estimating larger hydraulic conductivities, but it does not effectively estimate the lower values characteristic of the fine-grained Upper Muddy Creek formation (UMCf-fg).

When evaluating the estimates of hydraulic conductivity per lithology type, there is a similar trend. The NMR technology best estimates hydraulic conductivity in the alluvium (Qal), where the hydraulic conductivity is generally higher. For the UMCf, the NMR result tends to overestimate the expected value from slug testing for the fine-grained formation. The lower *K* values are not effectively predicted by the NMR result and this is especially true for wells within the fine-grained UMCf.

E.3.2 Total and Effective Porosity Estimates

The NMR measurements provide estimates of mobile and total pore water content as a percentage of soil volume (%V). In saturated soils, total porosity and total water content are equivalent, and the mobile pore water is assumed to represent the effective porosity. As with the data analysis for hydraulic conductivity, the differences between laboratory measured porosities and NMR estimated porosities have been analyzed (for wells where there was laboratory physical test data available for comparison). Negative differences indicate the NMR estimate is less than the porosity estimate from the laboratory test. Figure E-10 shows a boxplot of the differences by OU and lithology for the total and effective porosity estimates. The corresponding summary statistics for the differences are presented in the tables below. This evaluation was based on results from both the OU-1/OU-2 RI and the Downgradient Study Area Investigation and treatability/pilot studies.

Difference in Total Porosity Estimates (θ^{TOT}_{NMR} - $\theta^{TOT}_{laboratory}$), per OU

Operable Unit	Count	Mean Difference (%V)	Range of Differences (%V)	Root Mean Square Difference (%V)
OU-1	40	-28	-46 – -3	29
OU-2	39	-9	-39 – 28	19
OU-3	10	-15	-43 – 18	24

Difference in Total Porosity Estimates (θ^{TOT}_{NMR} - $\theta^{TOT}_{laboratory}$), per lithology

Lithology Type	Count	Mean Difference (%V)	Range of Differences (%V)	Root Mean Square Difference (%V)
Qal	3	-15	-30 – 0	19
UMCf-fg	86	-18	-46 – 28	25

Difference in Effective Porosity Estimates ((θ^{EFF}_{NMR} - $\theta^{EFF}_{laboratory}$), per OU

Operable Unit	Count	Mean Difference (%V)	Range of Differences (%V)	Root Mean Square Difference (%V)
OU-1	40	-16	-30 – -7	17
OU-2	39	-6	-19 – 2	7
OU-3	10	-9	-16 – -2	10

Difference in Effective Porosity Estimates ((θ^{EFF}_{NMR} - $\theta^{EFF}_{laboratory}$), per lithology

Lithology Type	Count	Mean Difference (%V)	Range of Differences (%V)	Root Mean Square Difference (%V)
Qal	3	-5	-10 – -2	6
UMCf-fg	86	-11	-30 – 2	13

The NMR results are consistently lower than the laboratory results for both total and effective porosity. The mean differences found in OU-1 are approximately twice as large as the mean differences found within OU-2 or OU-3. In terms of lithology, the differences in total and effective porosity estimates within the Qal are smaller than those within the fine-grained UMCf; however, there were only three samples within the Qal that were available for this analysis.

To assess the reliability of the laboratory porosity results, they were compared against the reasonable range of values reported for sands, silts and clays of 26% to 61% (USGS 1967). It was found that 58 out of the 165 available laboratory results for total porosity were outside of the reported range, which suggests that approximately one third of the laboratory results may not be reliable. The reason for this is likely the disturbance of the soil samples that occurs during sample collection (AlQaysi and Sedrekarimi 2015). There is an additional concern that the samples collected from deeper intervals may not be representative of in-situ conditions due to the expansion of the samples after retrieval from subsurface. As the result of compaction, there is generally a decrease in porosity with depth (NRCS 2008). The laboratory methods for total and effective porosity do not attempt to correct for changes in pressure between in-situ conditions and the laboratory. As a result, porosity sample results from the deeper subsurface are likely to overestimate the in-situ porosity (Wuest 2009). Because the NMR instrument measures the porosity in-situ with no sample disturbance, the NMR results for porosity are considered to be more representative of site conditions than the laboratory results.

E.3.3 Summary

In general, the NMR logs were found to be a useful tool for confirming field observations of lithology and providing an estimate of porosity that is potentially more representative of in-situ conditions than laboratory measurements. In addition, the NMR data may be useful to support the evaluation of sequence stratigraphy to be presented in the forthcoming RI Report for OU-3. The NMR method is accurate to approximately within an order of magnitude for hydraulic conductivities above approximately 1 ft/day (4E-07 cm/s), but it is not accurate at predicting hydraulic conductivities in lower conductivity sediments.

E.4 REFERENCES

AlQaysi, Z. and Sedrekarimi, A. 2015. Determination of the porosity of granular soils using electrical resistivity measurements. Canadian Journal of Exploration Geophysics. June. http://csegjournal.com/assets/pdfs/2015/2015-06-CJEG-Determination_of_the_Porosity_of_Granular_Soils.pdf

Behroozmand, A., Keating, K., and Auken, E. 2014. A review of the principles and applications of the NMR technique for near-surface characterization. Surveys in Geophysics. 36 (1).

Kenyon, W.E., Day, P.I., Straley, C. et al. 1988. A Three-Part Study of NMR Longitudinal Relaxation Properties of Water-Saturated Sandstones. SPE Form Eval 3 (3): 622–636. SPE-15643-PA.

NRCS (Natural Resources Conservation Service). 2008. Soil Quality Indicator Sheets: Physical Properties: Bulk Density. USDA. June. https://www.nrcs.usda.gov/wps/PA_NRCSConsumption/download?cid=nrcs142p2_051591&ext=pdf

USGS (United States Geological Survey). 1967. Summary of hydrologic and physical properties of rock and soil materials, as analyzed by the hydrologic laboratory of the U.S. Geological Survey. USGS Water Supply Paper 1839-D. 1948-60.

Walsh, D., Turner, P., Grunewald, E., Zhang, H., Butler, J., Reboulet, E., Knobbe, S., Christy, T., Lane Jr., J., Johnson, C., Munday, T., Fitzpatrick, A. 2013. A small-diameter NMR logging tool for groundwater investigations. Groundwater 51, no. 6:914-926. https://ngwa.onlinelibrary.wiley.com/doi/abs/10.1111/gwat.12024

Wuest, Stewart. 2009. Correction of bulk density and sampling method biases using soil mass per unit area. Soil Science Society of America Journal. 73:312-316.

TABLES

TABLE E-1. NMR Logged Wells
Nevada Environmental Response Trust Site
Henderson, Nevada

Operable Unit	Well Name	Logging Date	Logging Interval (ft)	Depth Range (ft bgs)
OU-1	M-14D	6/26/2018	1.64	7.8 - 78.3
	M-22D	8/14/2018	1.64	9.2 - 63.3
	M-37	8/28/2018	1.64	7.8 - 32.4
	M-66D	6/13/2018	1.64	7.8 - 68.5
	M-72D	6/12/2018	1.64	9.3 - 68.3
	M-83D	8/21/2018	1.64	9.2 - 68.2
	M-117	8/8/2018	1.64	8.5 - 151.2
	M-118	7/19/2018	1.64	10.0 - 159.2
	M-125D	6/27/2018	1.64	7.4 - 68.0
	M-140D	6/12/2018	1.64	7.9 - 68.6
	M-153	8/22/2018	1.64	12.9 - 168.7
	M-154	4/25/2019	3.28	22.2 - 192.8
	M-161D	6/11/2018	1.64	7.6 - 138.8
	M-162D	7/16/2018	1.64	8.9 - 138.4
	M-165	8/16/2018	1.64	9.0 - 118.9
	M-181	8/17/2018	1.64	8.7 - 113.7
	M-196	8/28/2018	1.64	11.2 - 103.1
	M-197	8/29/2018	1.64	10.8 - 114.1
	M-198	8/28/2018	1.64	10.6 - 113.9
	M-200	8/15/2018	1.64	10.2 - 108.6
	M-201	6/28/2018	1.64	7.8 - 70.1
	M-202	6/28/2018	1.64	8.3 - 52.6
	M-203	6/27/2018	1.64	6.7 - 47.7
	M-204	6/14/2018	1.64	10.3 - 108.7
	M-205	6/14/2018	1.64	9.1 - 48.4
	M-206	6/14/2018	1.64	8.9 - 48.3
	M-207	6/15/2018	1.64	10.7 - 43.5
	M-210	6/15/2018	1.64	11.4 - 78.7
	M-213	6/25/2018	1.64	8.9 - 108.9
	M-214	7/25/2018	1.64	11.0 - 47.1
	M-218	7/25/2018	1.64	8.6 - 108.6
	M-220	7/24/2018	1.64	7.8 - 68.5
	M-222	6/13/2018	1.64	7.0 - 108.7
	M-231	6/28/2018	1.64	8.5 - 118.4
	M-234	7/2/2018	1.64	6.6 - 83.7
	M-235	7/6/2018	1.64	7.9 - 103.0
	M-236	8/8/2018	1.64	10.7 - 100.9
	M-238	8/8/2018	1.64	8.4 - 108.5
	M-240	8/30/2018	1.64	12.9 - 112.9
	M-244	6/25/2018	1.64	6.2 - 103.0
	M-246	6/26/2018	1.64	7.8 - 68.5
	M-260	4/17/2019	1.64	35.2 - 74.6
	M-261	4/17/2019	1.64	31.8 - 74.5
	M-262	4/17/2019	1.64	30.5 - 89.6
	M-263	4/18/2019	1.64	31.6 - 70.9
	M-264	4/18/2019	1.64	31.9 - 94.2

TABLE E-1. NMR Logged Wells
Nevada Environmental Response Trust Site
Henderson, Nevada

Operable Unit	Well Name	Logging Date	Logging Interval (ft)	Depth Range (ft bgs)
OU-1	M-265	4/18/2019	1.64	33.6 - 69.7
	M-266	4/19/2019	1.64	31.0 - 99.9
	M-267	4/22/2019	1.64	44.9 - 94.1
	M-268	4/22/2019	1.64	47.9 - 115.2
	M-269	4/5/2019	1.64	29.4 - 68.7
	M-270	4/8/2019	1.64	29.7 - 98.6
	M-271	4/16/2019	1.64	16.9 - 135.0
	TR-2	6/29/2018	1.64	8.2 - 173.9
	TR-4	7/1/2018	1.64	7.5 - 143.6
	TR-6	7/2/2018	1.64	8.9 - 69.6
	TR-7	6/30/2018	1.64	8.0 - 290.1
	TR-9	7/24/2018	1.64	7.7 - 248.8
OU-2	ES-1	9/7/2018	1.64	10.4 - 108.8
	ES-4	9/9/2018	1.64	9.4 - 88.2
	ES-7	9/25/2018	1.64	49.2 - 77.1
	ES-8B	9/25/2018	1.64	44.2 - 108.1
	ES-9	9/10/2018	1.64	86.8 - 98.3
	ES-10	9/4/2018	1.64	10.5 - 62.9
	ES-12	9/24/2018	1.64	35.9 - 63.7
	ES-13	9/11/2018	1.64	22.1 - 102.5
	ES-15	9/25/2018	1.64	55.5 - 88.3
	ES-16	10/9/2018	1.64	60.1 - 96.2
	ES-17	10/9/2018	1.64	57.0 - 98.0
	ES-18	10/8/2018	1.64	57.6 - 108.5
	ES-19	10/8/2018	1.64	65.0 - 174.9
	ES-20	9/25/2018	1.64	57.0 - 109.5
	ES-28	9/6/2018	1.64	9.3 - 83.1
	ES-30	8/27/2018	1.64	9.3 - 91.3
	ES-31	8/27/2018	1.64	9.2 - 73.2
	ES-32	9/24/2018	1.64	48.3 - 90.9
	ES-33	6/6/2018	1.64	8.2 - 31.2
	ES-34	6/6/2018	1.64	8.1 - 39.2
	ES-35	6/6/2018	1.64	6.9 - 42.9
	ES-36	6/7/2018	1.64	7.2 - 43.3
	ES-37	6/7/2018	1.64	7.4 - 35.3
	ES-38	6/7/2018	1.64	7.1 - 38.2
	ES-39	6/7/2018	1.64	7.2 - 43.3
	ES-40	4/23/2019	1.64	44.0 - 109.6
	ES-41	4/23/2019	1.64	35.5 - 109.3
	ES-42	4/23/2019	1.64	35.9 - 109.7
	ES-43	4/24/2019	1.64	25.9 - 109.5
	ES-44	4/23/2019	1.64	34.4 - 54.1
	M-152	9/26/2018	1.64	30.7 - 142.2
	MC-MW-37R2	9/27/2018	1.64	31.8 - 61.3
	MCF-09A	5/24/2019	1.64	36.9 - 281.3
	MCF-20A	6/4/2019	1.64	58.1 - 295.9

TABLE E-1. NMR Logged Wells
Nevada Environmental Response Trust Site
Henderson, Nevada

Operable Unit	Well Name	Logging Date	Logging Interval (ft)	Depth Range (ft bgs)
OU-2	PC-40R	4/24/2019	3.28	23.8 - 53.3
	PC-134D	10/1/2018	1.64	30.7 - 88.1
	PC-137D	10/1/2018	1.64	33.7 - 87.9
	PC-162	10/1/2018	1.64	13.6 - 43.1
	PC-165	10/2/2018	1.64	14.9 - 36.2
	PC-168	10/3/2018	1.64	22.8 - 32.6
	PC-172D	10/4/2018	1.64	28.4 - 48.1
	PC-175	10/4/2018	1.64	28.1 - 37.9
	PC-176	10/2/2018	1.64	21.8 - 72.7
	PC-177	10/2/2018	1.64	26.9 - 58.1
	PC-179	10/3/2018	1.64	15.2 - 48.0
	PC-182	9/27/2018	1.64	25.6 - 83.0
	PC-187R	9/26/2018	1.64	25.7 - 53.6
	PC-188	10/4/2018	1.64	35.4 - 58.4
	PC-193	10/3/2018	1.64	20.1 - 48.0
	PC-194	10/2/2018	1.64	16.2 - 55.6
	PC-195	9/20/2018	1.64	27.0 - 72.9
	PC-196	9/20/2018	1.64	15.6 - 73.0
	PC-197	9/20/2018	1.64	27.6 - 73.6
OU-3	COH-2B	9/12/2018	1.64	18.8 - 59.8
	ES-21A*	8/23/2018	1.64	10.7 - 46.8
	ES-22B	9/17/2018	1.64	13.8 - 77.8
	ES-23B	9/17/2018	1.64	21.6 - 185.6
	ES-24	9/13/2018	1.64	19.9 - 77.3
	ES-25B	8/23/2018	1.64	7.5 - 78.1
	ES-26	8/23/2018	1.64	7.5 - 78.1
	ES-27	8/24/2018	1.64	7.8 - 78.4
	LNDMW-1	9/12/2018	1.64	21.0 - 58.8
	MCF-29B	4/24/2019	1.64	7.6 - 173.2
	MW-18(HEND)	8/24/2018	1.64	21.8 - 105.5
	NERT3.35S1	5/13/2019	1.64	19.8 - 54.3
	NERT3.40S1	5/14/2019	1.64	30.2 - 53.2
	NERT3.58N1	5/15/2019	1.64	33.1 - 59.3
	NERT3.58S1	5/13/2019	1.64	32.7 - 50.8
	NERT3.60N1	5/15/2019	1.64	32.0 - 50.0
	NERT3.60S1	5/13/2019	1.64	35.9 - 53.9
	NERT3.63S1	5/13/2019	1.64	21.8 - 33.3
	NERT3.80S1	7/18/2018	1.64	9.7 - 17.9
	NERT3.98S1	5/13/2019	1.64	10.5 - 33.4
	NERT4.21N1	9/4/2018	1.64	10.1 - 52.7
	NERT4.38N1	9/4/2018	1.64	9.6 - 37.5
	NERT4.51S1	7/18/2018	1.64	11.6 - 49.4
	NERT4.64N1	5/15/2019	1.64	25.5 - 43.5
	NERT4.64S1	5/14/2019	1.64	26.0 - 53.9
	NERT4.65N1	5/15/2019	1.64	24.5 - 44.2
	NERT4.70N1	5/15/2019	1.64	25.6 - 43.6
	NERT4.71N1	5/15/2019	1.64	27.4 - 43.8

TABLE E-1. NMR Logged Wells
Nevada Environmental Response Trust Site
Henderson, Nevada

Operable Unit	Well Name	Logging Date	Logging Interval (ft)	Depth Range (ft bgs)
OU-3	NERT4.71S1	7/17/2018	1.64	10.7 - 45.2
	NERT4.71S2	5/14/2019	1.64	23.7 - 53.2
	NERT4.93S1	7/17/2018	1.64	11.4 - 52.4
	NERT5.11S1	7/17/2018	1.64	10.1 - 42.9
	NERT5.49S1	7/20/2018	1.64	11.3 - 39.2
	NERT5.91S1	7/20/2018	1.64	10.2 - 48.0
	PC-56	9/24/2018	1.64	14.6 - 44.1
	PC-82	4/24/2019	1.64	26.9 - 61.3
	PC-156B	10/1/2018	1.64	12.2 - 41.7
	PC-178	9/21/2018	1.64	21.7 - 67.6
	PC-191	4/24/2019	1.64	11.6 - 21.5

Notes:
ft = feet
ft bgs = feet below ground surface
* = ES-21A was logged in place of ES-21B

TABLE E-2. NMR Logged Wells, Downgradient Study Area Investigation and Treatability/Pilot Studies
Nevada Environmental Response Trust Site
Henderson, Nevada

Operable Unit	Well Name	Investigation	Depth Interval (ft bgs)
OU-1	U4-E-01D	Unit 4 ISB Treatability Study	4.5 - 93.1
	U4-E-02D		4.5 - 93.1
	U4-E-04D		4.5 - 93.1
	U4-E-05D		4.5 - 93.1
	U4IS-MW-02D		4.5 - 93.1
OU-2	ES-40	Galleria ZVI Treatability Study	44.0 - 109.6
	ES-41		35.5 - 109.3
	ES-42		35.9 - 109.7
	ES-43		25.9 - 109.5
	ES-44		34.4 - 54.1
	GRTS-MW01B	Galleria Bio Treatability Study	5.2 - 108.6
	GRTS-MW02B		4.8 - 108.1
	GRTS-MW03B		4.5 - 109.4
	GRTS-MW04B		5.5 - 108.8
	GRTS-MW05B		5.0 - 83.7
OU-3	LVWPS-MW101	Las Vegas Wash Pilot Study	4.8 - 62.2
	LVWPS-MW102		4.8 - 95.0
	LVWPS-MW103		5.9 - 94.5
	LVWPS-MW104		4.5 - 32.4
	LVWPS-MW105		4.6 - 25.9
	LVWPS-MW106		5.4 - 48.0
	LVWPS-MW107		5.3 - 118.5
	LVWPS-MW108		4.6 - 117.8
	LVWPS-MW109		5.2 - 49.5
	LVWPS-MW110		5.2 - 65.9
	LVWPS-MW111		5.8 - 76.4
	LVWPS-MW112		4.6 - 71.9
	LVWPS-MW201B		5.5 - 77.7
	LVWPS-MW202		5.8 - 60.0
	LVWPS-MW203		5.4 - 118.6
	LVWPS-MW204		5.7 - 68.0
	LVWPS-MW204C		7.6 - 168.3
	LVWPS-MW205		4.9 - 118.1
	LVWPS-MW206C		5.6 - 118.8
	LVWPS-MW206E		7.0 - 203.8
	LVWPS-MW207		5.6 - 85.9
	LVWPS-MW208B		5.0 - 70.6
	LVWPS-MW209		4.6 - 88.2
	LVWPS-MW209C		7.7 - 168.4
	LVWPS-MW210C		5.7 - 118.8
	LVWPS-MW210E		7.2 - 163.0
	LVWPS-MW211		5.6 - 67.9
	LVWPS-MW212B		5.7 - 77.9
	LVWPS-MW212D		7.2 - 143.3
	LVWPS-MW213		5.8 - 58.3
	LVWPS-MW214		5.7 - 41.8
	LVWPS-MW215B		5.8 - 43.6
	LVWPS-MW216		5.1 - 18.3

TABLE E-2. NMR Logged Wells, Downgradient Study Area Investigation and Treatability/Pilot Studies
Nevada Environmental Response Trust Site
Henderson, Nevada

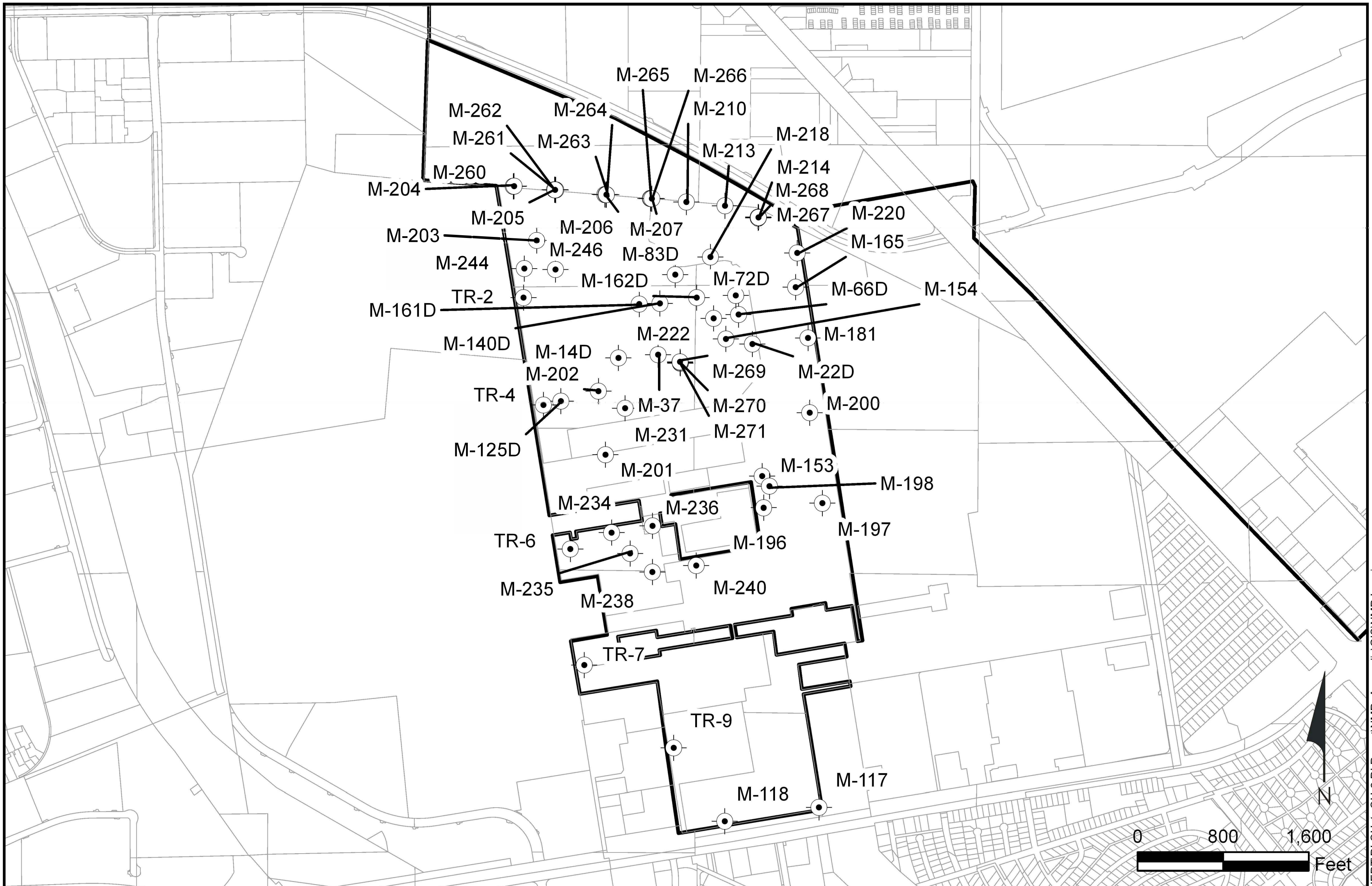
Operable Unit	Well Name	Investigation	Depth Interval (ft bgs)
OU-3	LVWPS-MW217C	Las Vegas Wash Pilot Study	8.0 - 173.6
	LVWPS-MW218C		7.1 - 28.4
	LVWPS-MW219C		7.1 - 133.4
	LVWPS-MW220B		8.1 - 150.8
	LVWPS-MW221B		8.1 - 101.6
	LVWPS-MW222C		7.0 - 233.3
	LVWPS-MW223C		8.1 - 108.1
	LVWPS-MW224C		7.4 - 192.7
	LVWPS-MW225B		8.2 - 108.2
	LVWPS-MW226B		8.5 - 95.4
	NERT3.35S1	Downgradient Investigation	19.9 - 54.4
	NERT3.40S1		30.5 - 53.5
	NERT3.58N1		33.2 - 59.4
	NERT3.58S1		32.9 - 51.0
	NERT3.60N1		32.0 - 50.1
	NERT3.60S1		36.1 - 54.2
	NERT3.63S1		22.0 - 33.4
	NERT3.80S1		9.7 - 17.9
	NERT3.98S1		10.7 - 33.6
	NERT4.21N1		10.1 - 52.7
	NERT4.38N1		9.6 - 37.5
	NERT4.51S1		11.6 - 49.4
	NERT4.64N1		25.8 - 43.8
	NERT4.64S1		26.3 - 54.1
	NERT4.65N1		24.8 - 44.5
	NERT4.70N1		26.0 - 44.1
	NERT4.71N1		27.7 - 44.1
	NERT4.71S1		10.7 - 45.2
	NERT4.71S2		24.1 - 53.6
	NERT4.93S1		11.4 - 52.4
	NERT5.11S1		10.1 - 42.9
	NERT5.49S1		11.3 - 39.2
	NERT5.91S1		10.2 - 48.0
	PC-94	Seep Well Field Treatability Study	7.0 - 16.8
	SWFTS-IW01B		3.1 - 34.3
	SWFTS-IW02B		2.1 - 33.2
	SWFTS-IW03		2.8 - 33.9
	SWFTS-IW04		3.2 - 32.7
	SWFTS-IW05		3.4 - 31.3
	SWFTS-IW06B		3.5 - 31.4
	SWFTS-IW07		2.2 - 35.0
	SWFTS-IW08		2.1 - 34.9
	SWFTS-IW09		2.9 - 45.6
	SWFTS-IW10		2.1 - 44.8
	SWFTS-IW11		2.1 - 34.9
	SWFTS-IW12		3.4 - 36.2
	SWFTS-IW13B		2.8 - 35.6

TABLE E-2. NMR Logged Wells, Downgradient Study Area Investigation and Treatability/Pilot Studies
Nevada Environmental Response Trust Site
Henderson, Nevada

Operable Unit	Well Name	Investigation	Depth Interval (ft bgs)
OU-3	SWFTS-IW14	Seep Well Field Treatability Study	2.9 - 34.0
	SWFTS-IW15		2.1 - 33.2
	SWFTS-IW16B		3.2 - 34.4
	SWFTS-IW17		3.3 - 34.5
	SWFTS-IW18		2.9 - 35.7
	SWFTS-IW19		2.9 - 42.2
	SWFTS-IW20		2.4 - 48.3
	SWFTS-MW01		3.7 - 34.8
	SWFTS-MW02		5.3 - 29.9
	SWFTS-MW03		3.7 - 39.8
	SWFTS-MW04		6.4 - 39.2
	SWFTS-MW05A		3.7 - 26.6
	SWFTS-MW05B		3.7 - 39.8
	SWFTS-MW06A		5.3 - 21.7
	SWFTS-MW06B		5.3 - 36.5
	SWFTS-MW07A		2.8 - 27.4
	SWFTS-MW07B		3.7 - 36.5
	SWFTS-MW08A		4.5 - 35.6
	SWFTS-MW08C		5.3 - 70.9
	SWFTS-MW09A		2.8 - 27.4
	SWFTS-MW09B		3.7 - 34.8
	SWFTS-MW10A		4.5 - 34.0
	SWFTS-MW10C		3.7 - 61.1

Notes:
ft bgs = feet below ground surface

FIGURES



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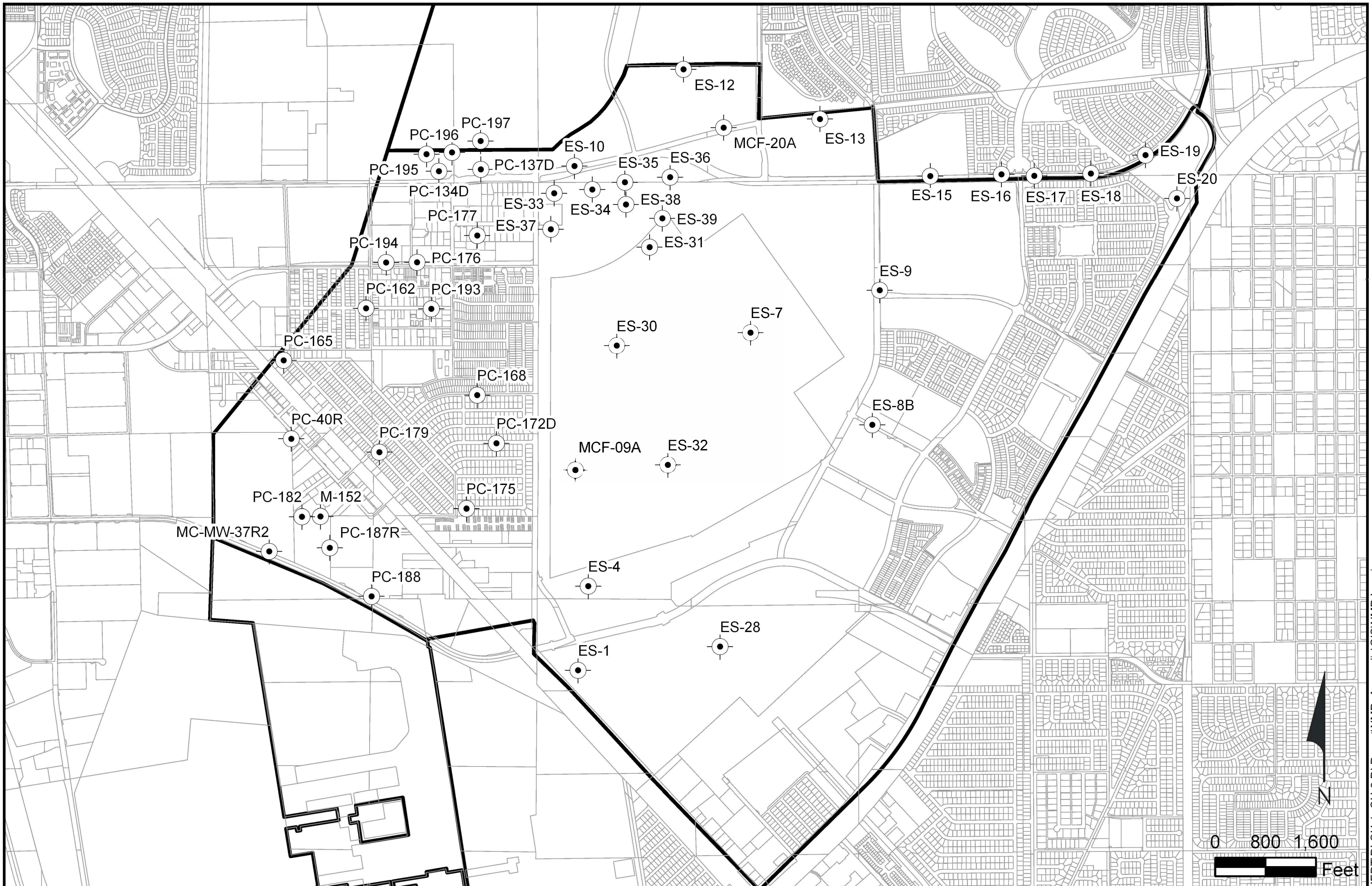
RAMBOLL

NMR Logging Locations, OU-1
Nevada Environmental Response Trust Site
Henderson, Nevada

Figure
E-1

Drafter: MFS | Date: 6/7/2019 | Contract Number: 1690011200 | Approved by: | Revised:



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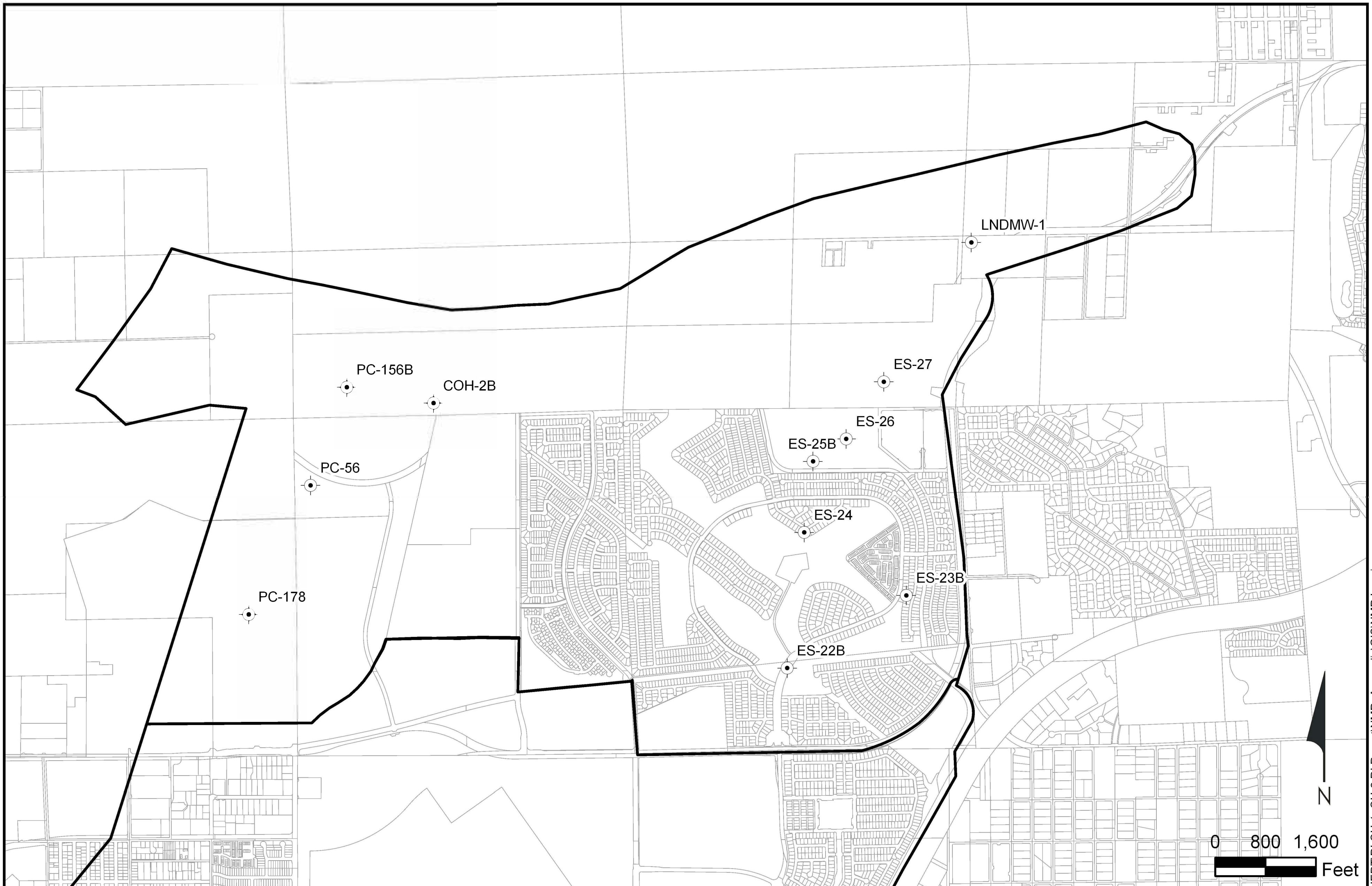
RAMBOLL

NMR Logging Locations, OU-2
Nevada Environmental Response Trust Site
Henderson, Nevada

Figure
E-2

Drafter: MFS | Date: 6/13/2019 | Contract Number: 1690011200 | Approved by: | Revised:



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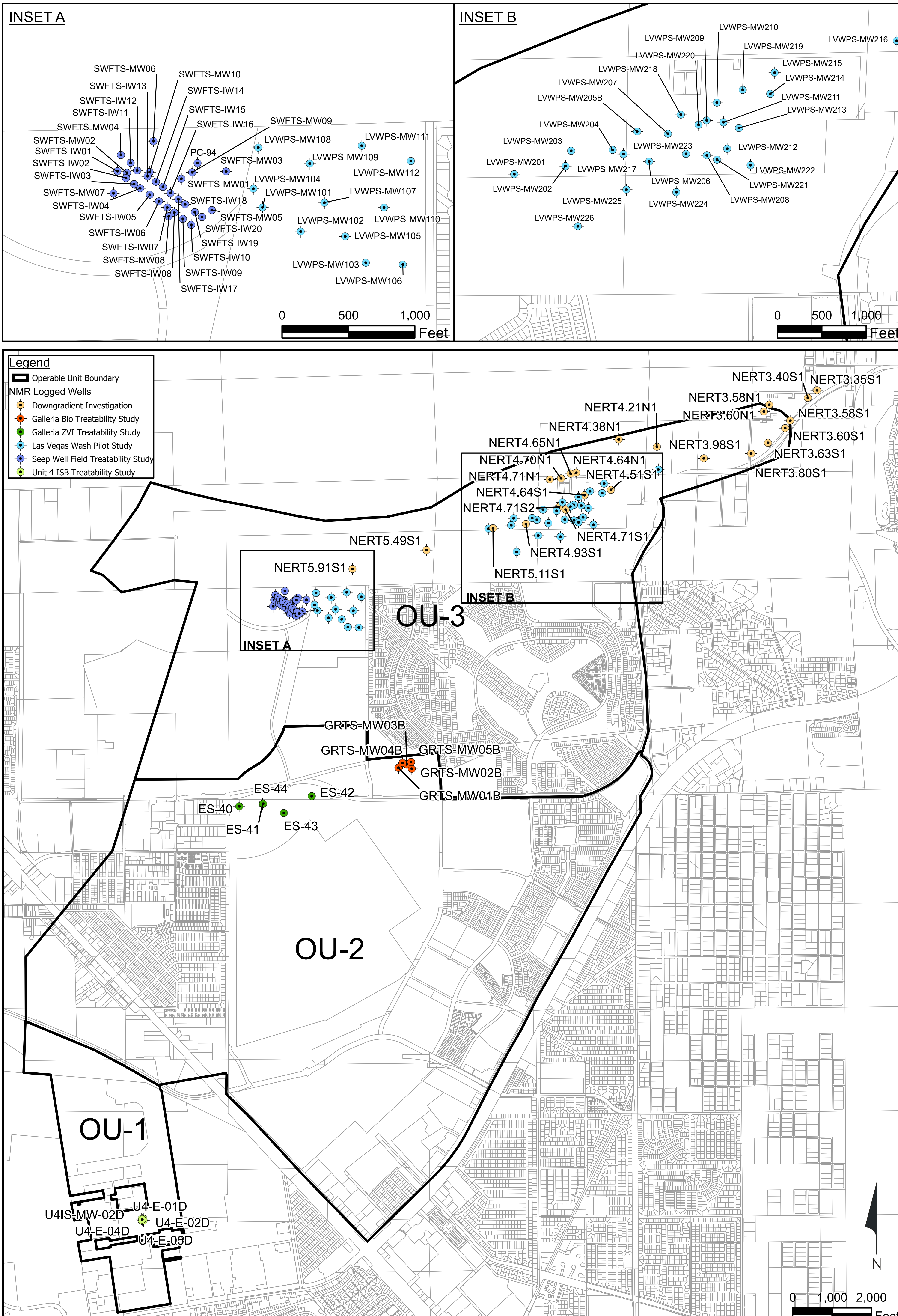
RAMBOLL

NMR Logging Locations, OU-3
Nevada Environmental Response Trust Site
Henderson, Nevada

Figure
E-3

Drafter: MFS | Date: 6/13/2019 | Contract Number: 1690011200 | Approved by: | Revised:



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RAMBOLL

NMR Logging Locations, Downgradient Study Area Investigation and Treatability/Pilot Studies
Nevada Environmental Response Trust Site
Henderson, Nevada

Figure **E-4**

Drafter: MFS	Date: 9/24/2019	Contract Number: 1690011200	Approved by:	Revised:

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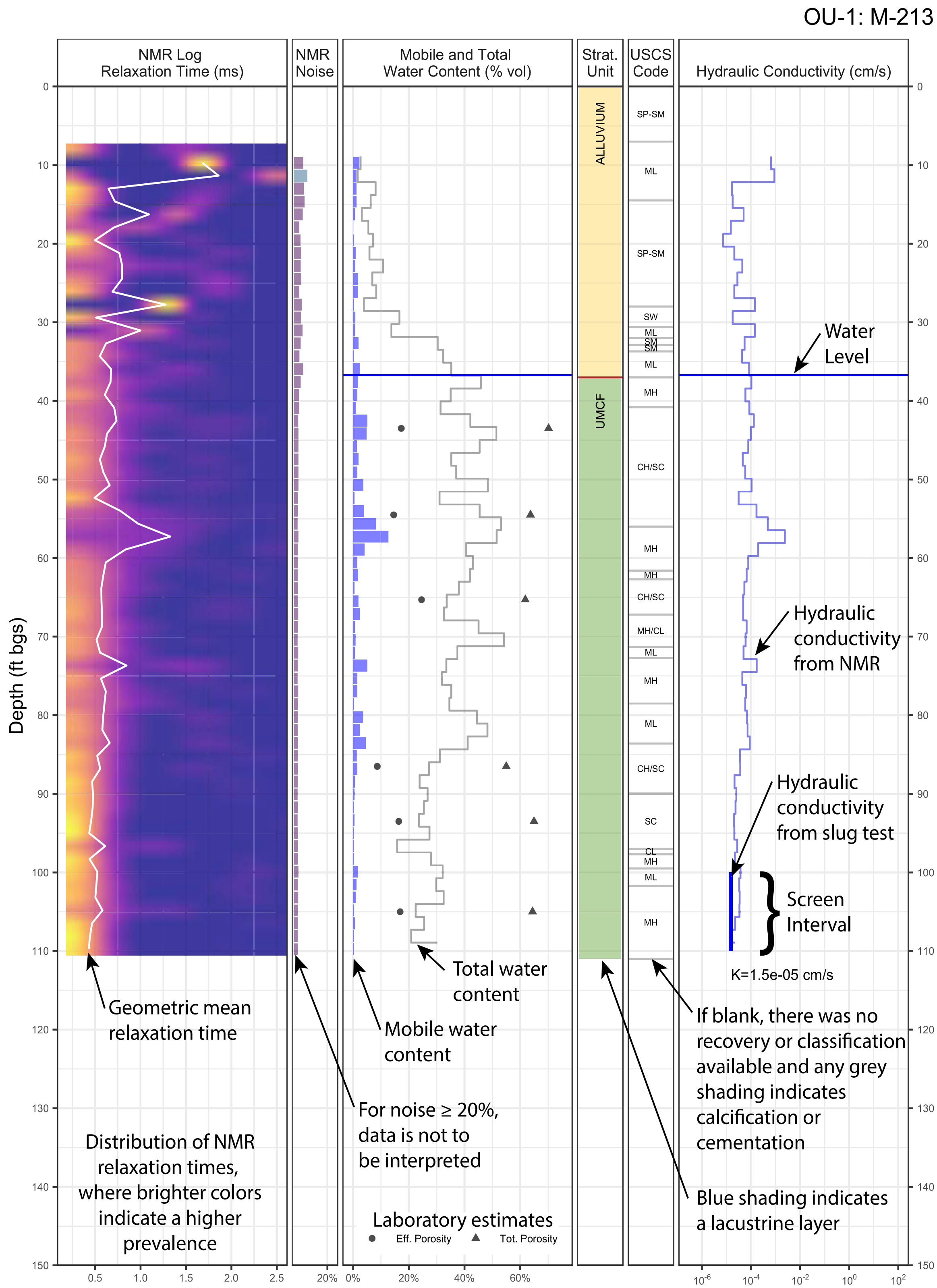

Example NMR Log
OU-1/OU-2 Remedial Investigation
Nevada Environmental Response Trust Site; Henderson, Nevada

Figure
E-5

Drafter: CS | Date: 05/22/19 | Contract Number: 1690011200 | Approved: | Revised:

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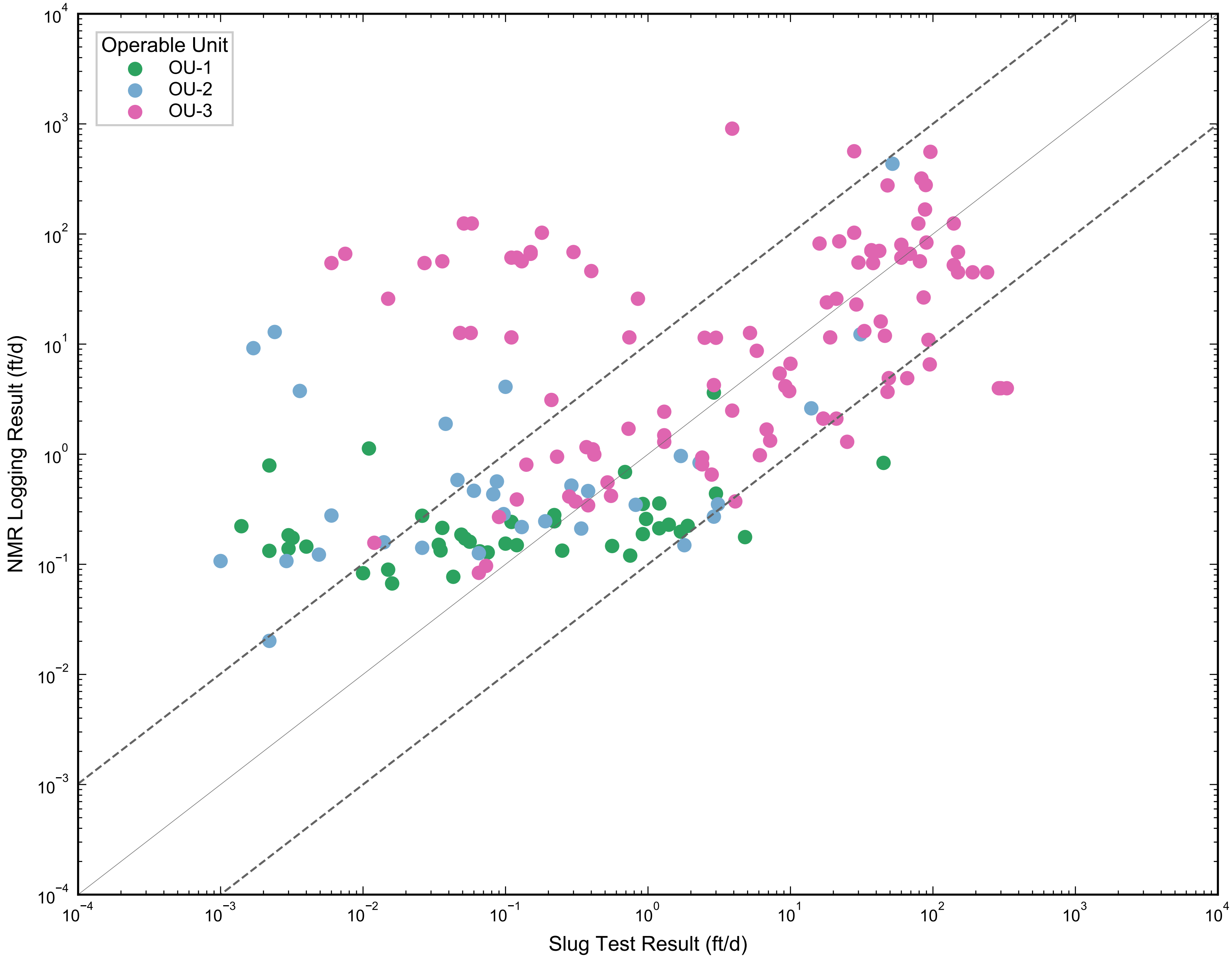
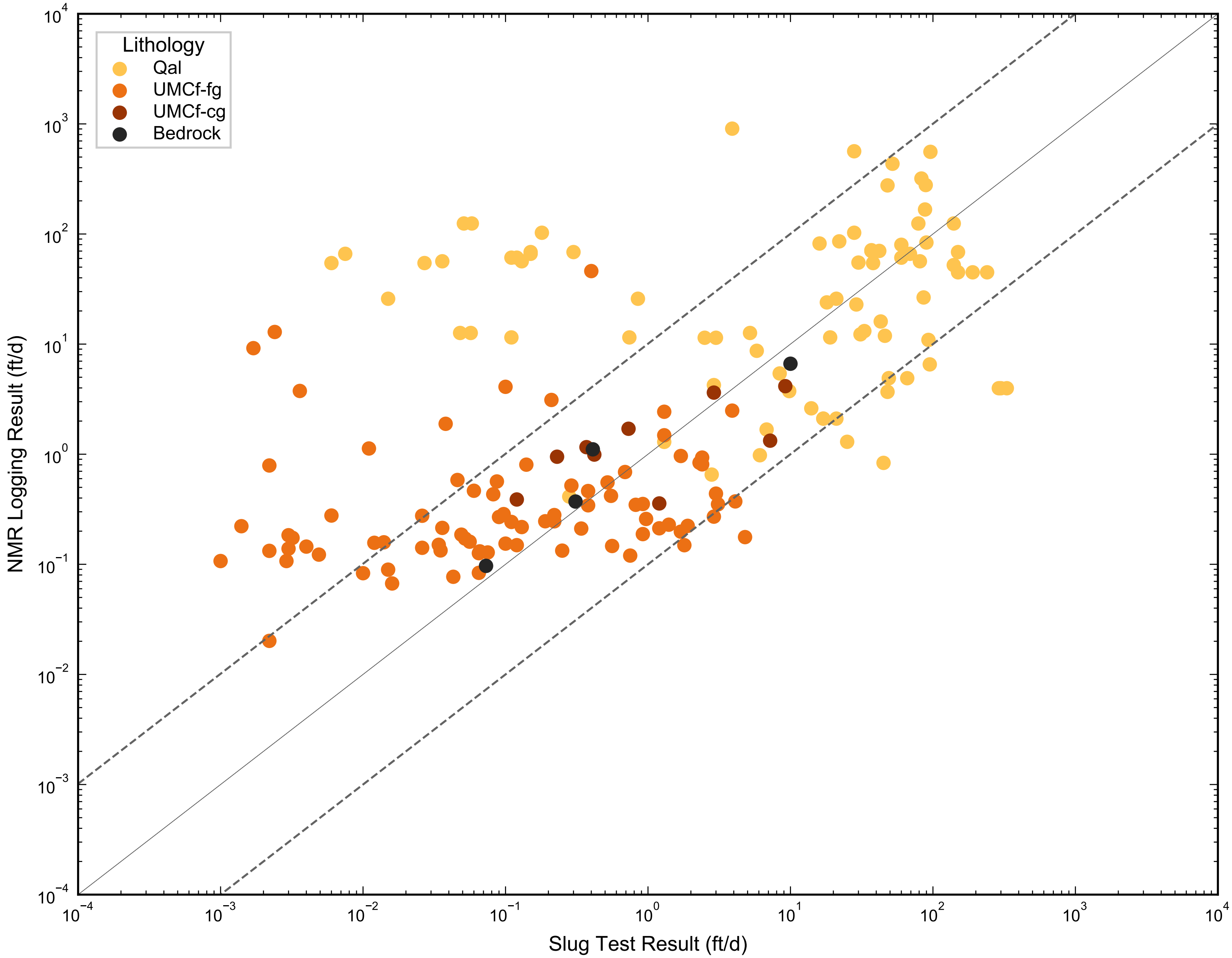


Comparison of Hydraulic Conductivity Estimates, per Operable Unit
Nevada Environmental Response Trust Site
Henderson, Nevada

Figure
E-6

Drafter: MFS | Date: 08/01/19 | Contract Number: 1690011200 | Approved: | Revised:



RAMBOLL

Comparison of Hydraulic Conductivity Estimates, per Lithology
Nevada Environmental Response Trust Site
Henderson, Nevada

Figure
E-7

Drafter: MFS | Date: 08/01/19 | Contract Number: 1690011200 | Approved: | Revised:

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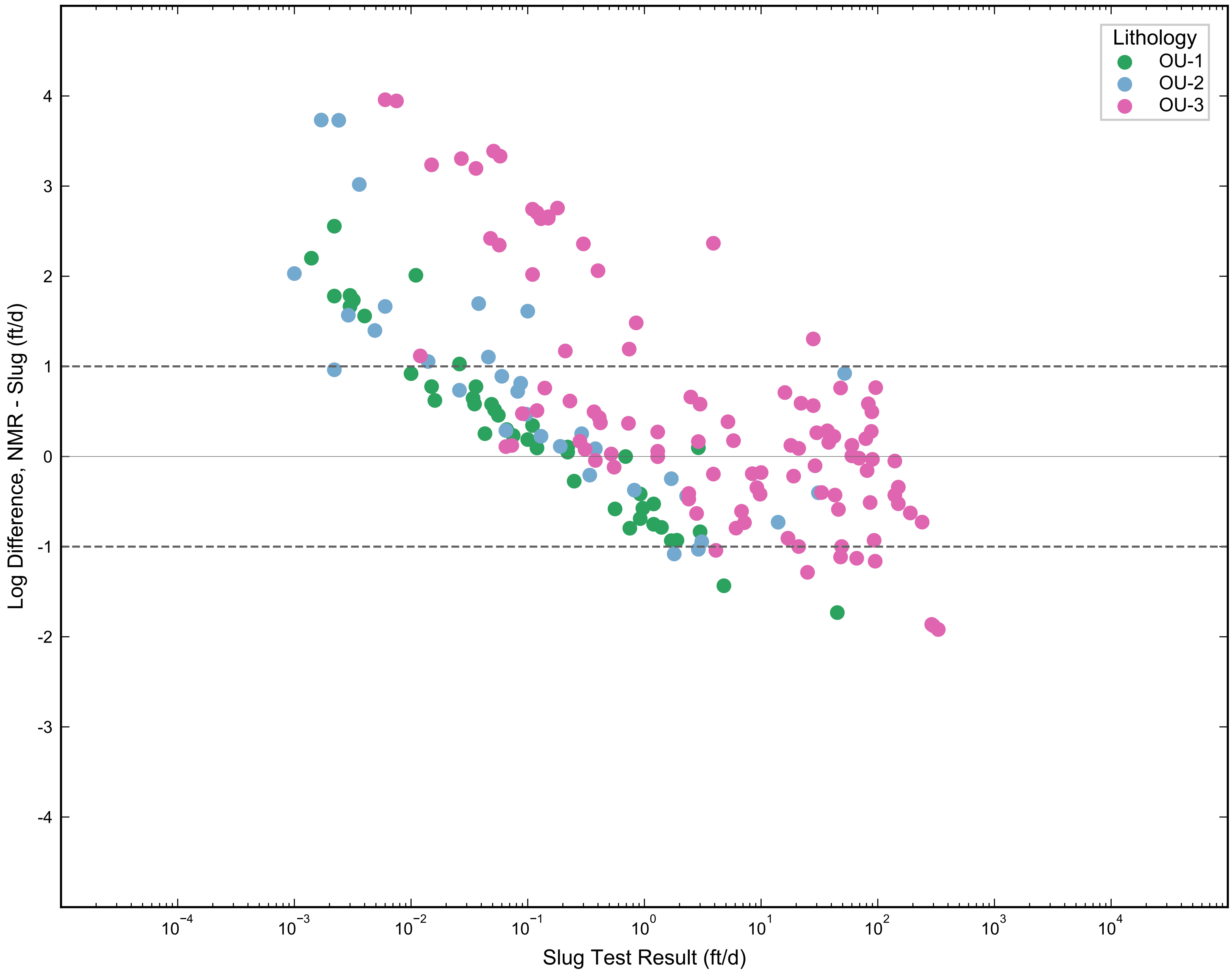

Difference Between NMR Hydraulic Conductivity and Slug Test Estimates, per Operable Unit
Nevada Environmental Response Trust Site
Henderson, Nevada

Figure
E-8

Drafter: MFS | Date: 08/01/19 | Contract Number: 1690011200 | Approved: | Revised:

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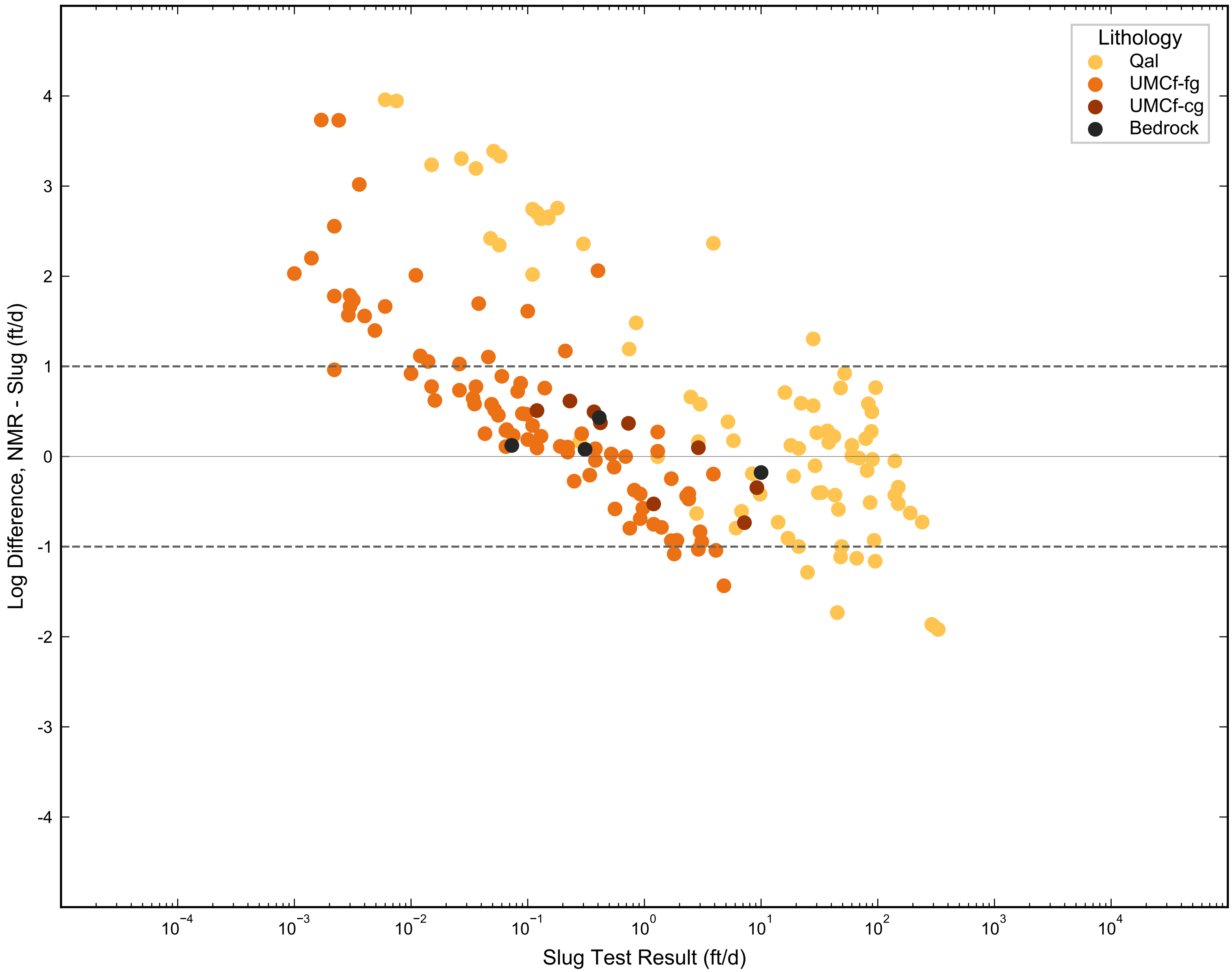

RAMBOLL

Difference Between NMR Hydraulic Conductivity and Slug Test Estimates, per Lithology
Nevada Environmental Response Trust Site
Henderson, Nevada

Figure
E-9

Drafter: MFS | Date: 08/01/19 | Contract Number: 1690011200 | Approved: | Revised:

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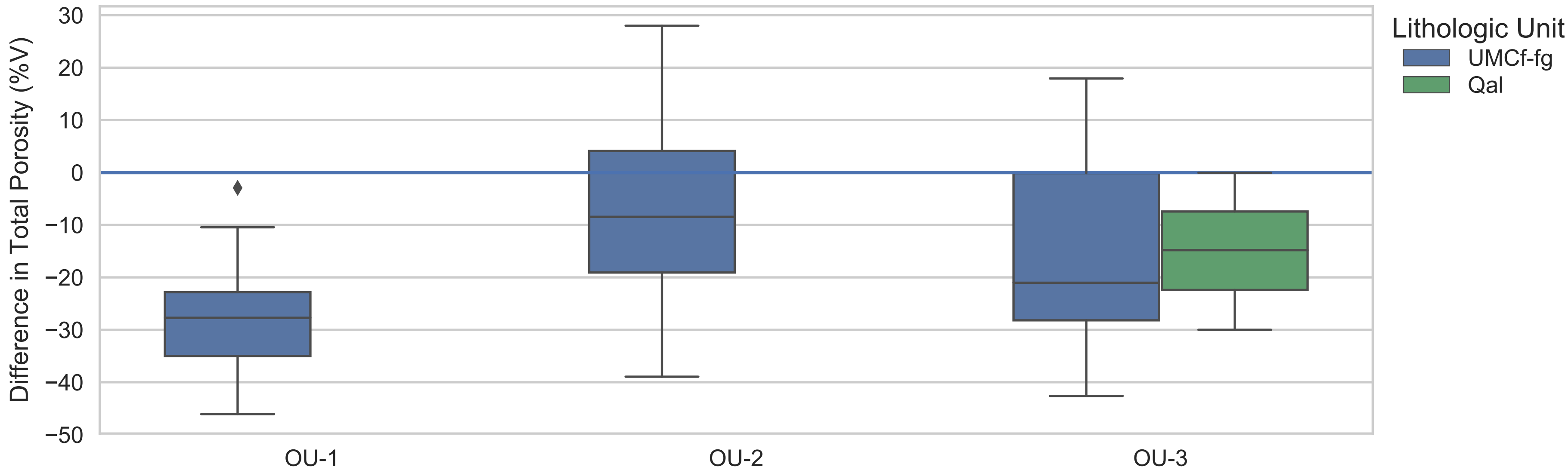
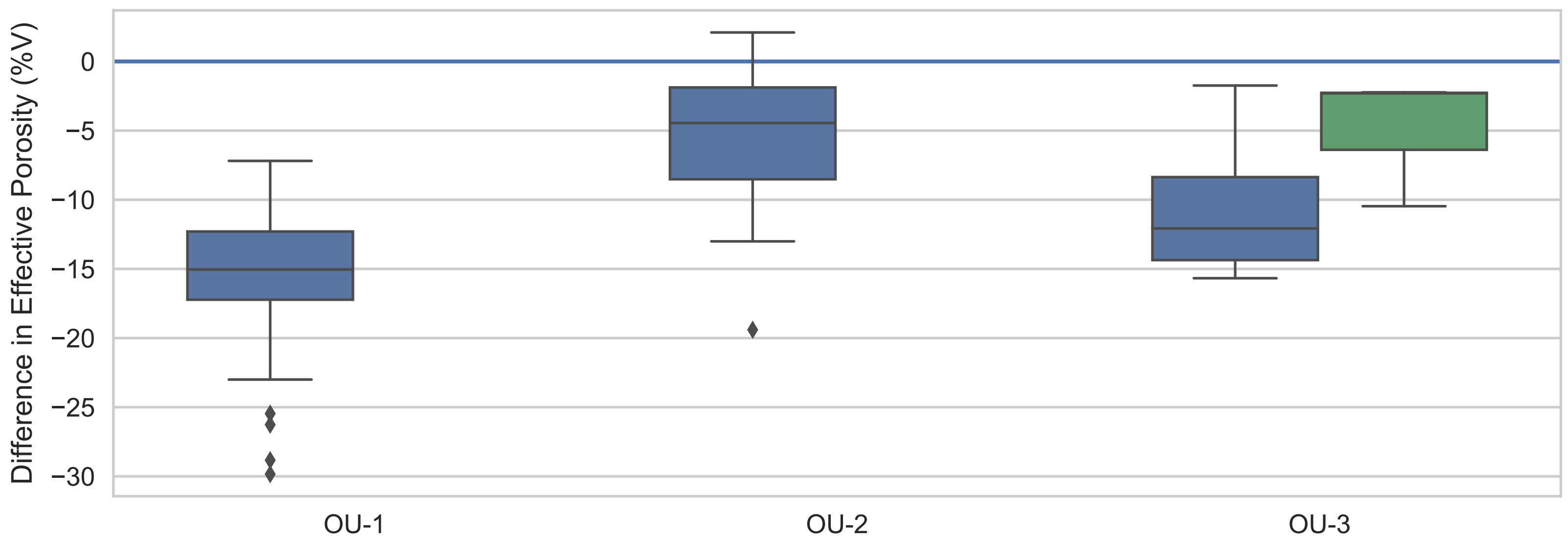




Note: The box plots illustrate the median, interquartile range (IQR), and outlying data points beyond 1.5 IQR. Differences reflect the NMR porosity results minus the laboratory porosity results.

RAMBOLL

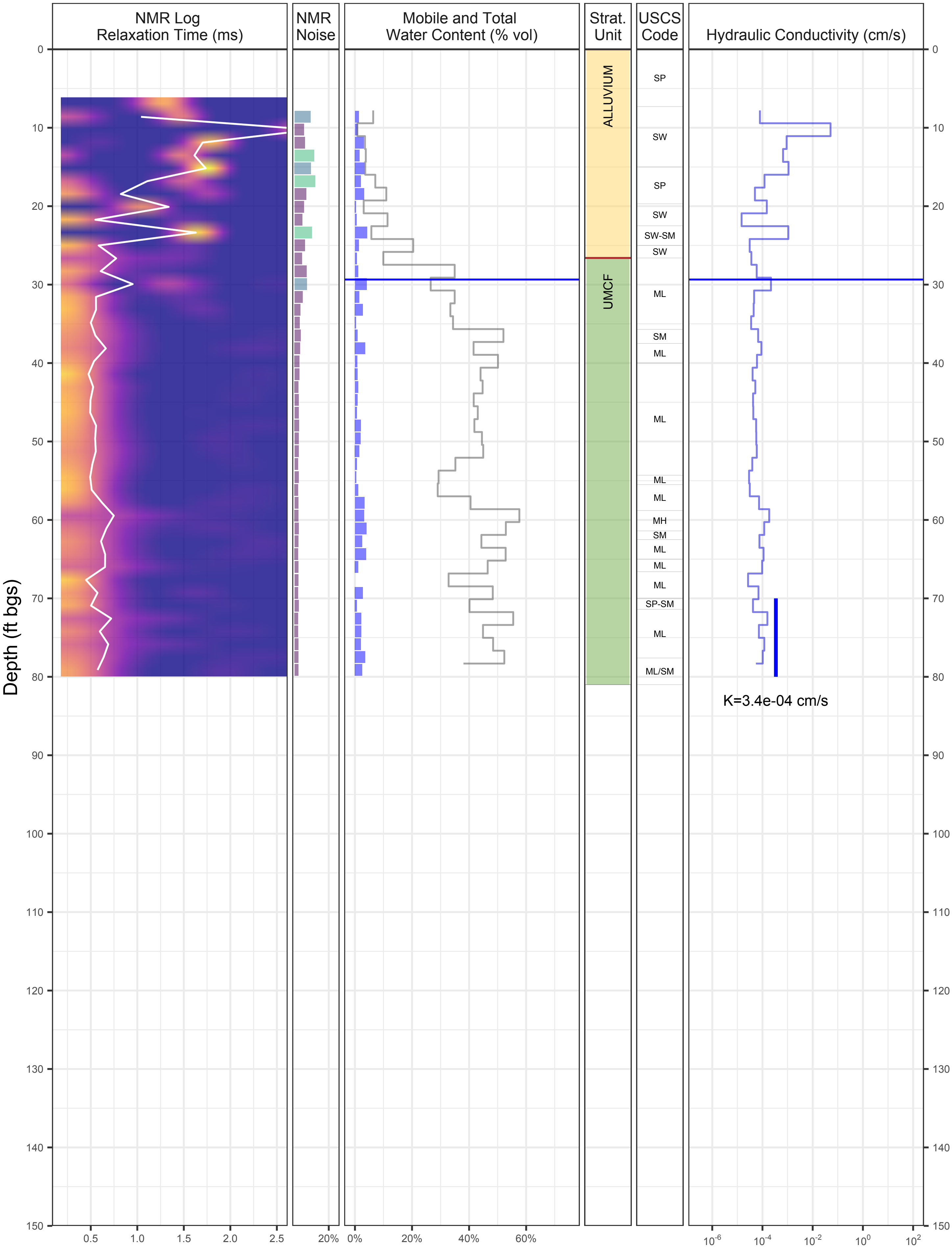
Distribution of Porosity Differences By Lithologic Unit and Operable Unit
Nevada Environmental Response Trust Site
Henderson, Nevada

Figure
E-10

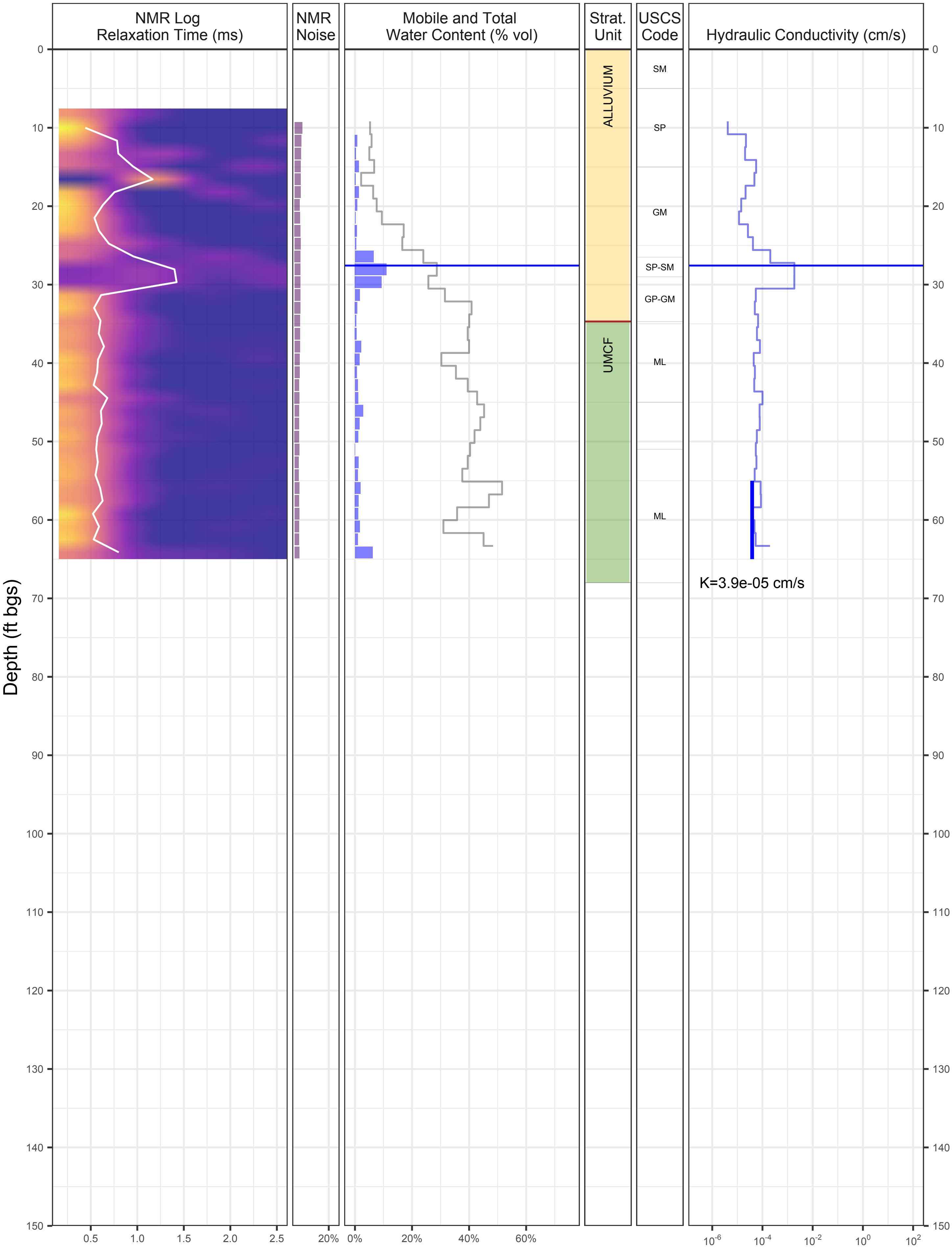
Drafter: MFS | Date: 08/01/19 | Contract Number: 1690011200 | Approved: | Revised:

ATTACHMENT

ATTACHMENT E-1
NMR LOGS

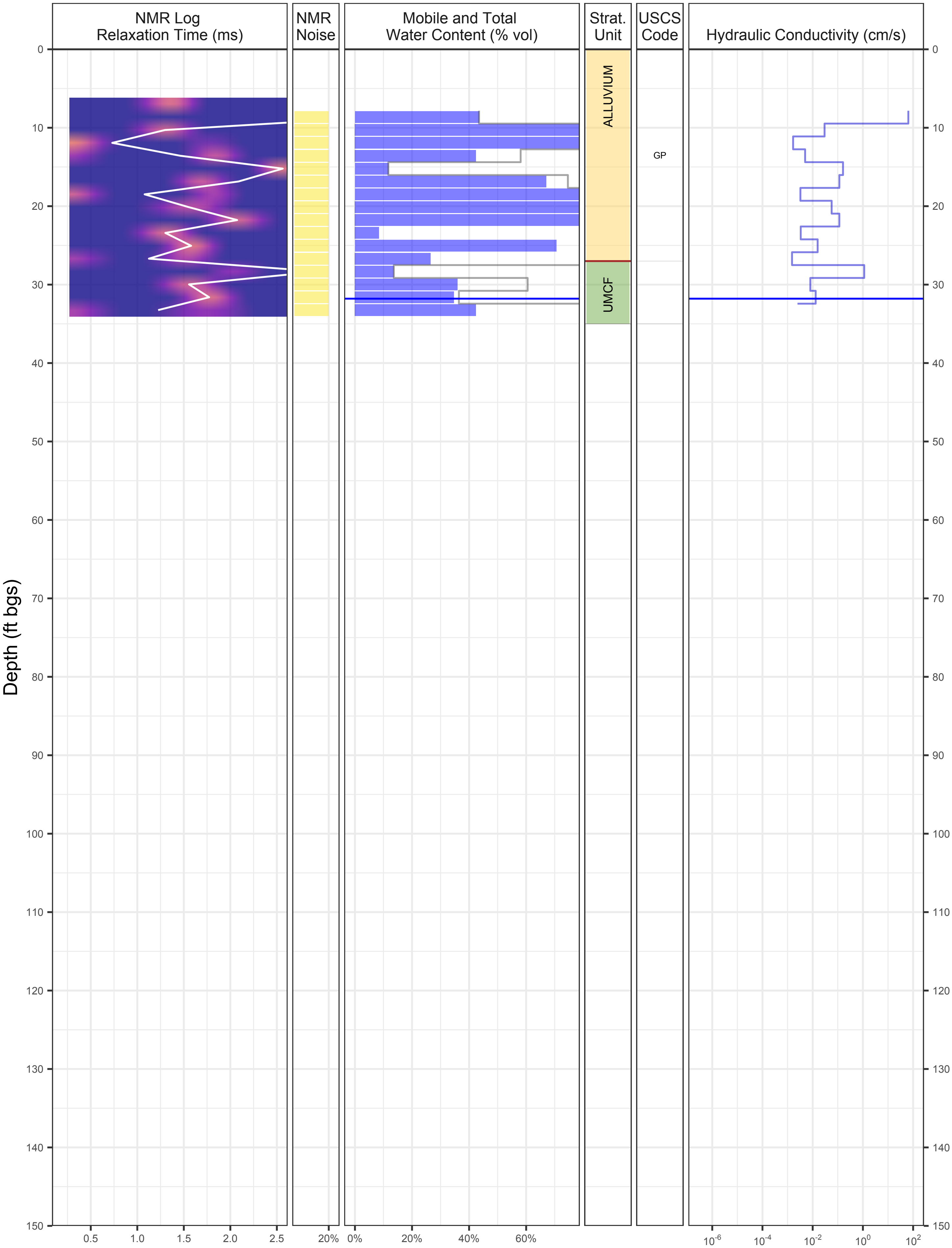

NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SP
SW
SP
SW
SW-SM
SW
ML
SM
ML
ML
ML
ML
MH
SM
ML
ML
ML
SP-SM
ML
ML/SM
K=3.4e-04 cm/s

OU-1: M-22D



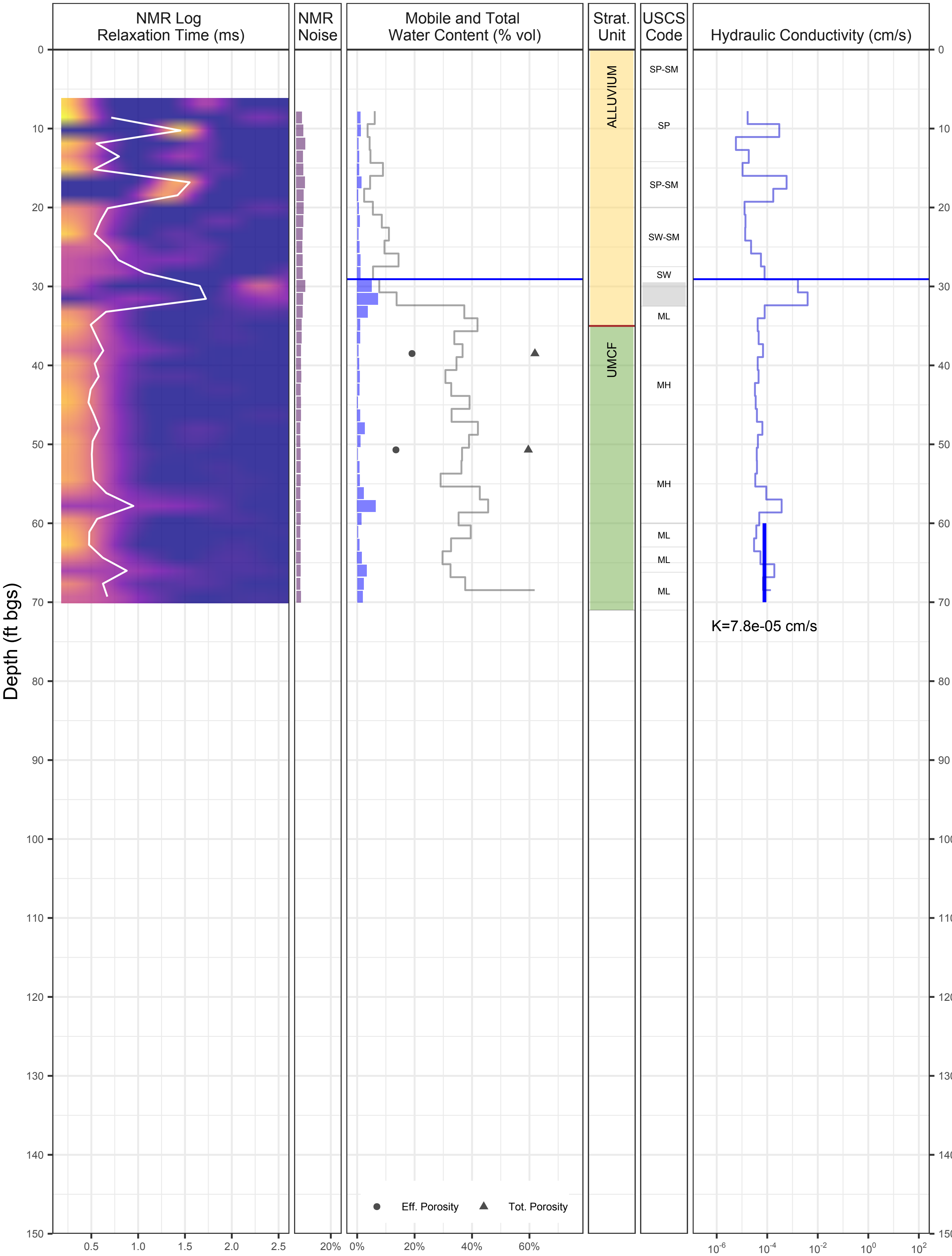
NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SM
SP
GM
SP-SM
GP-GM
ML
ML
K=3.9e-05 cm/s
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%

OU-1: M-37

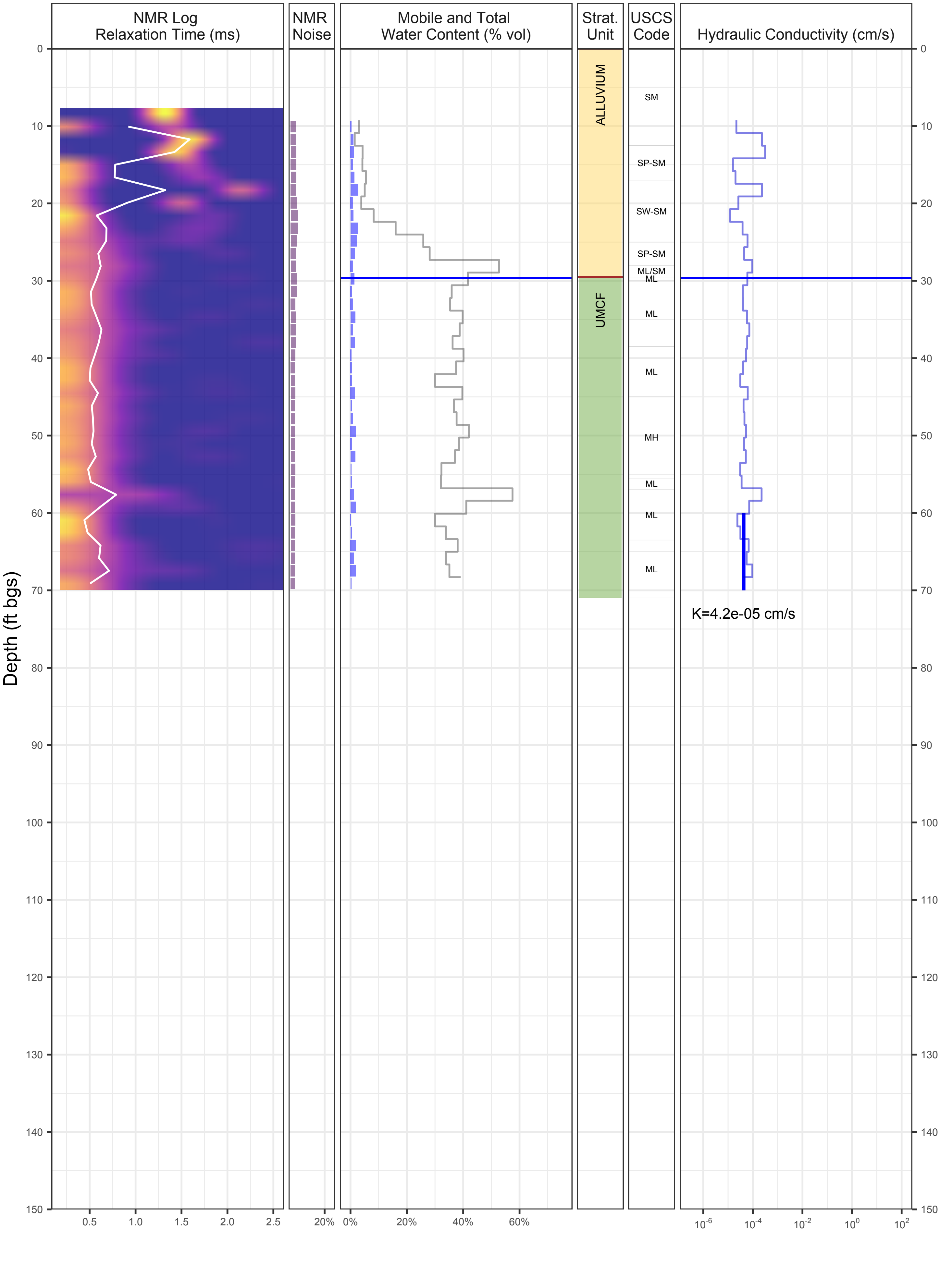


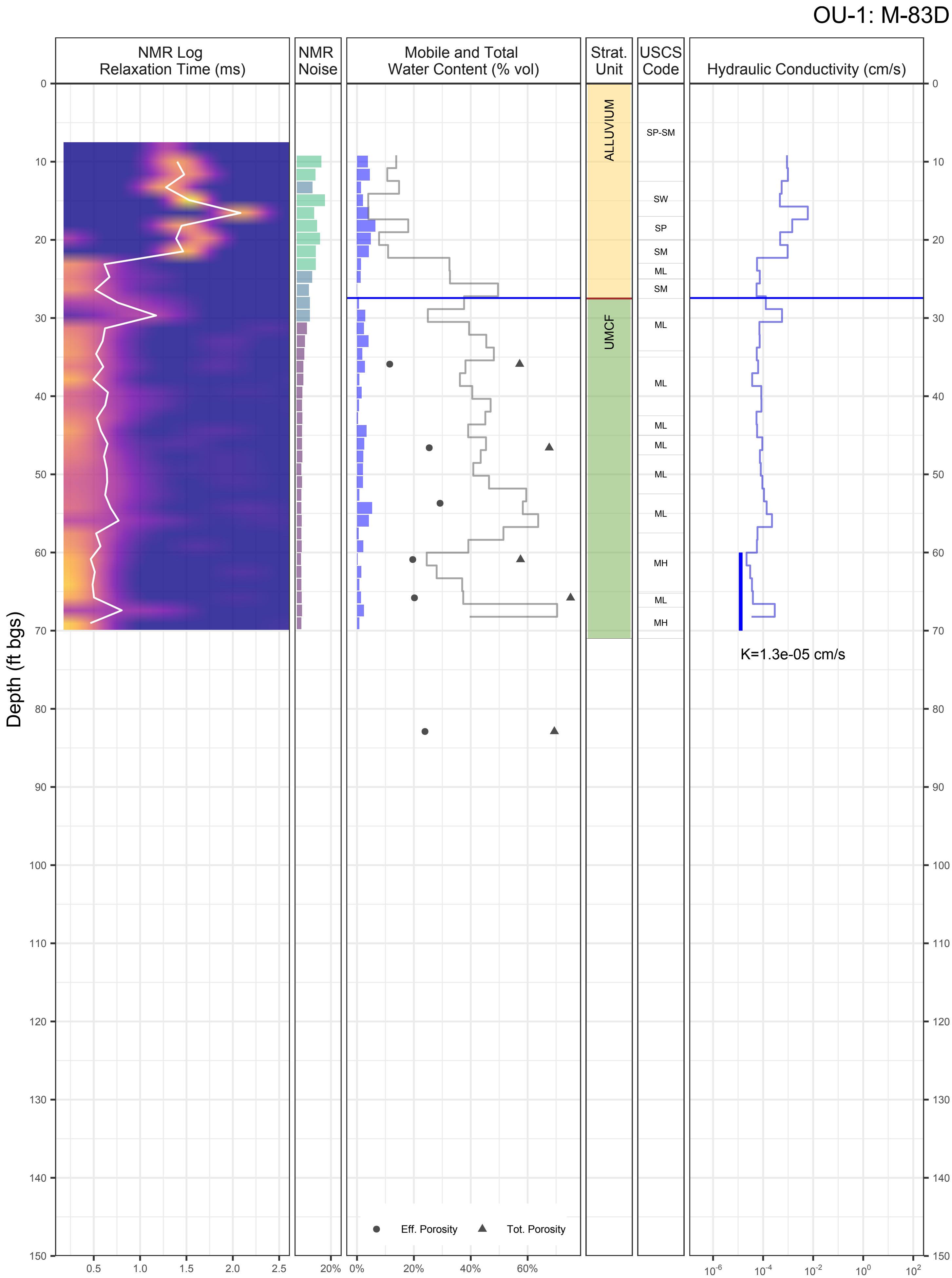
NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
GP
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}

OU-1: M-66D

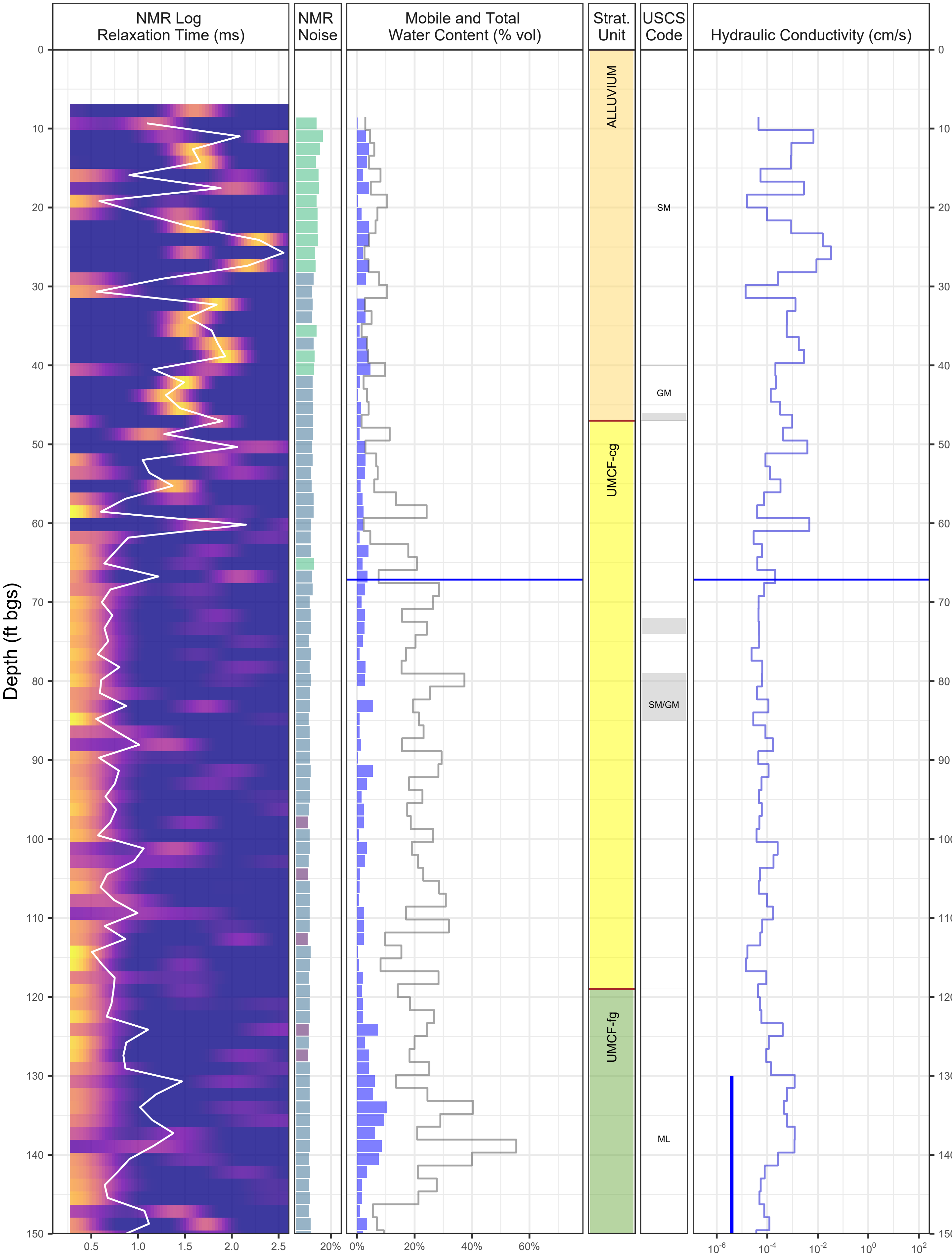

NMR Log
Relaxation Time (ms)
NMR
Noise
Mobile and Total
Water Content (% vol)
Strat.
Unit
USCS
Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
ALLUVIUM
UMCF
SP-SM
SP
SP-SM
SW-SM
SW
ML
MH
MH
ML
ML
ML
K=7.8e-05 cm/s
Eff. Porosity
Tot. Porosity

OU-1: M-72D

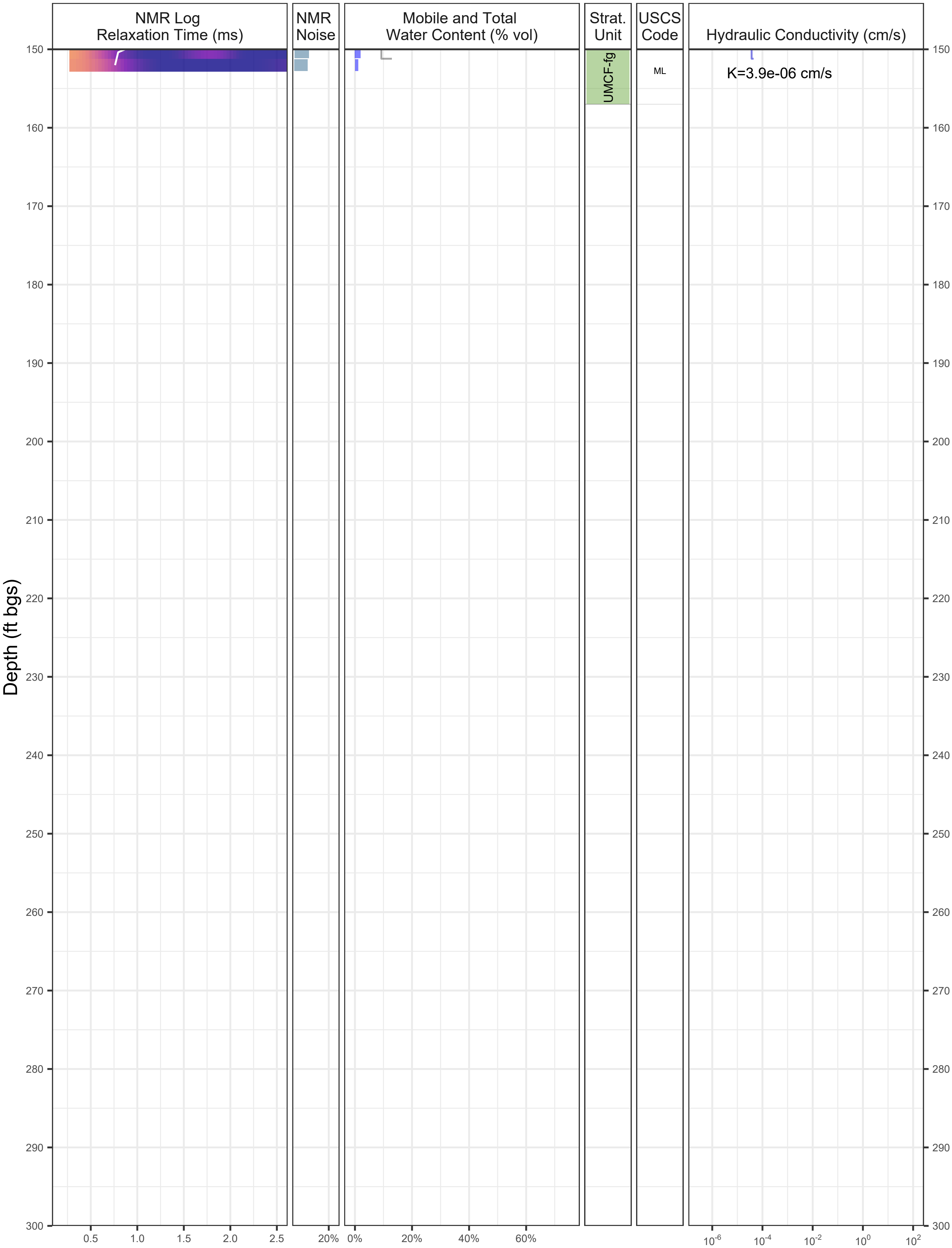

NMR Log
Relaxation Time (ms)
NMR
Noise
Mobile and Total
Water Content (% vol)
Strat.
Unit
USCS
Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SM
SP-SM
SW-SM
SP-SM
ML/SM
ML
ML
ML
MH
ML
ML
ML
K=4.2e-05 cm/s
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10-6
10-4
10-2
100
102



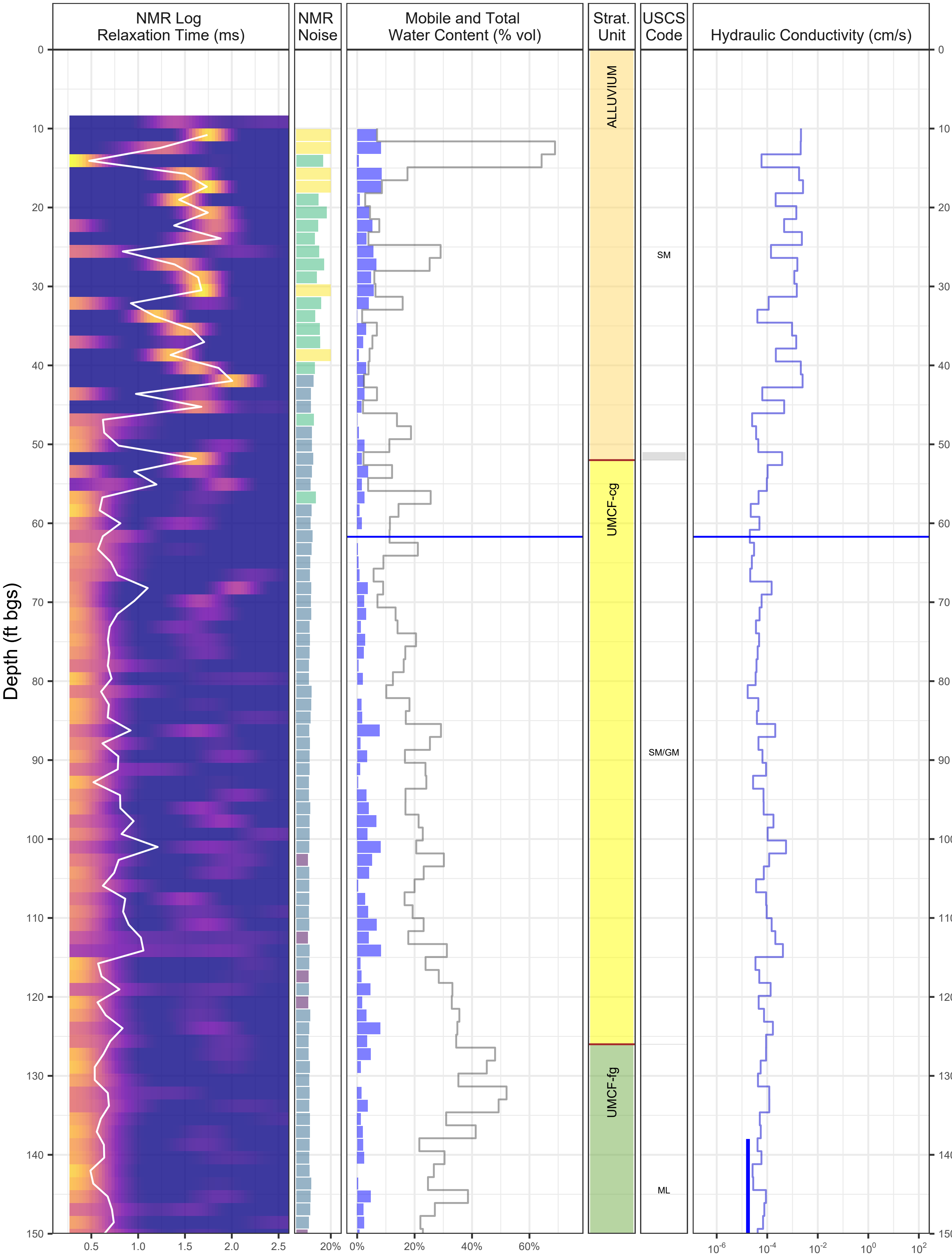
OU-1: M-83D
NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SP-SM
SW
SP
SM
ML
SM
ML
ML
ML
ML
ML
ML
MH
ML
MH
K=1.3e-05 cm/s
Eff. Porosity
Tot. Porosity



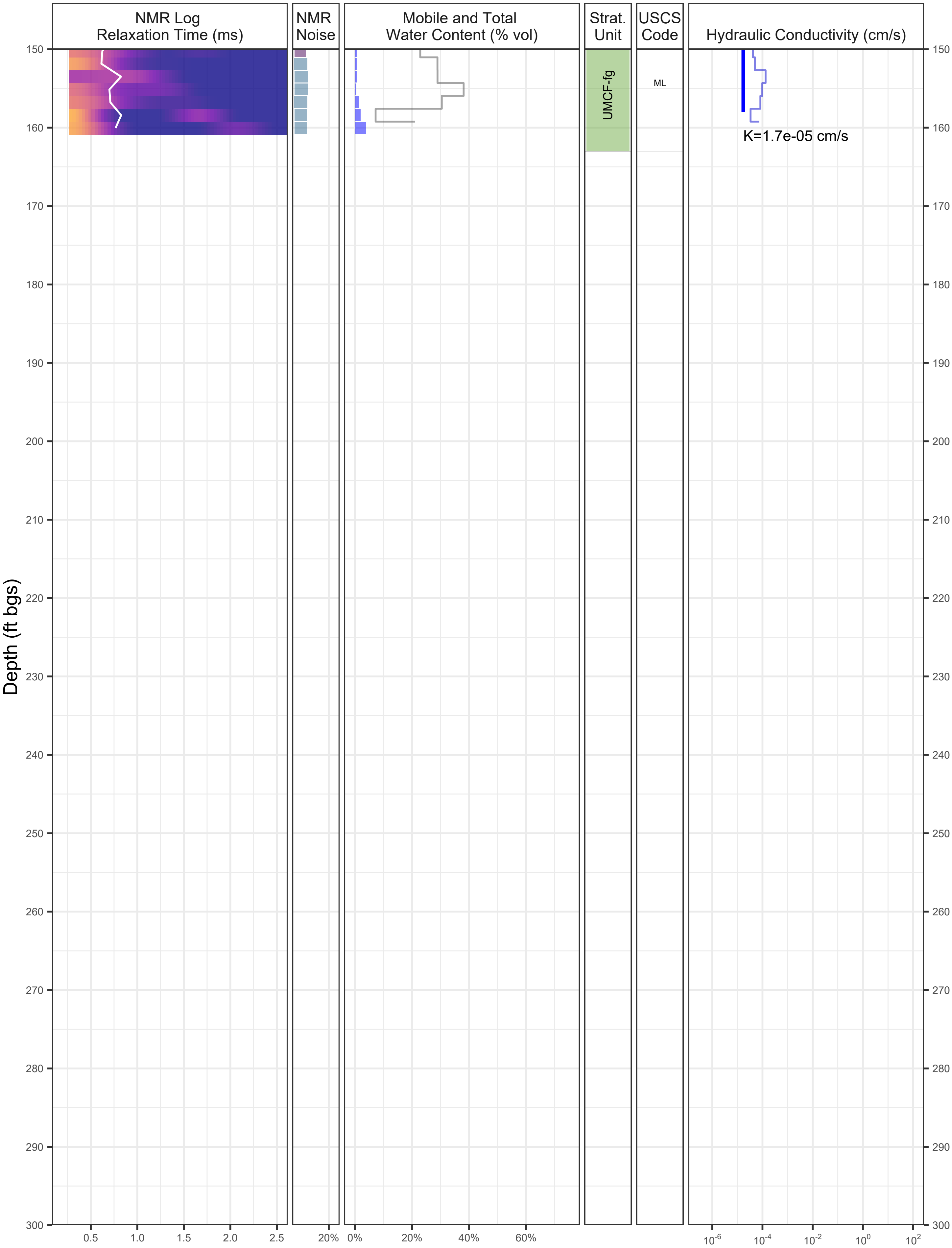
NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
ALLUVIUM
UMCF-cg
UMCF-fg
SM
GM
SM/GM
ML
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}


NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
UMCF-fg
ML
K=3.9e-06 cm/s
Depth (ft bgs)
150
160
170
180
190
200
210
220
230
240
250
260
270
280
290
300
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10-6
10-4
10-2
100
102

OU-1: M-118

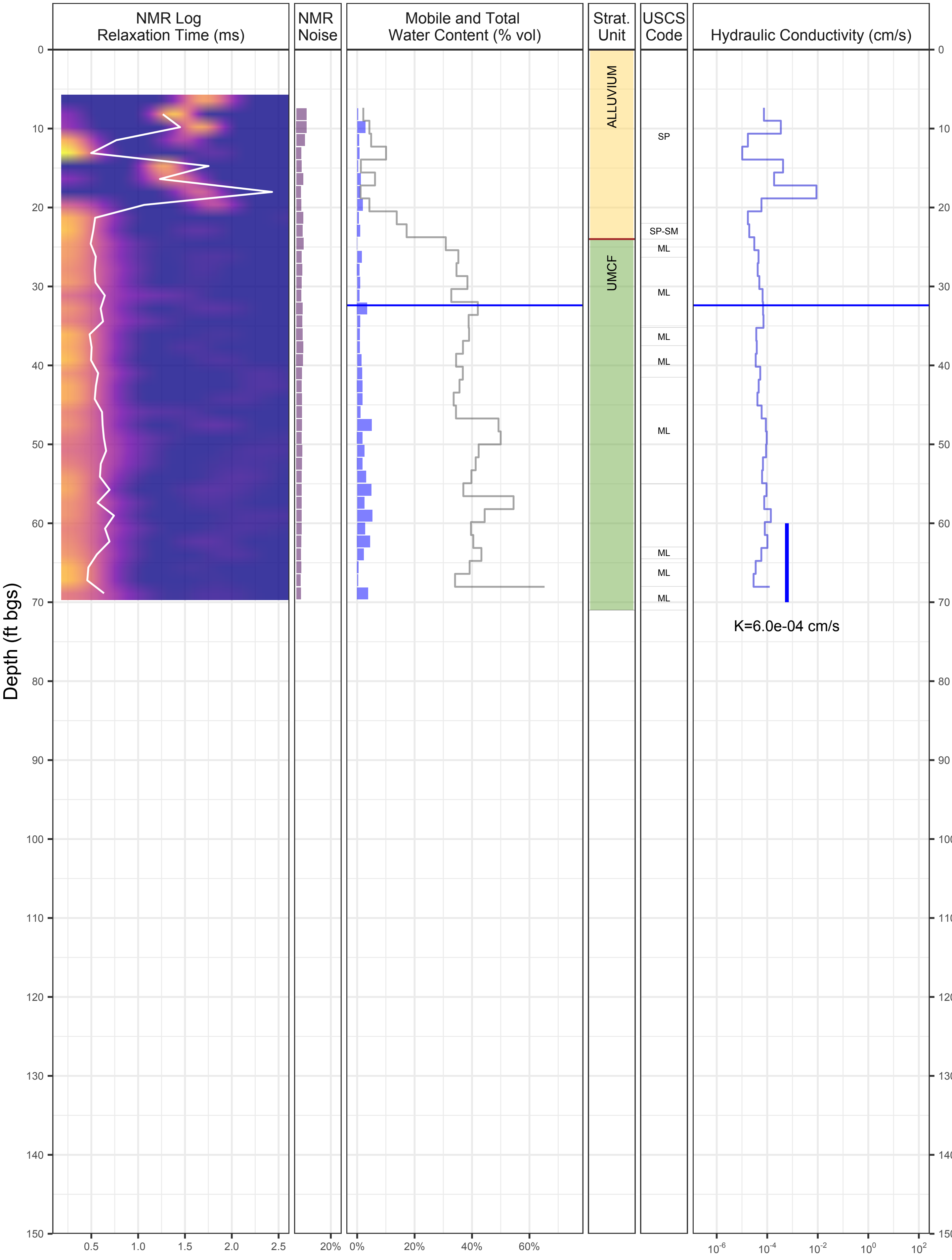

NMR Log
Relaxation Time (ms)
NMR
Noise
Mobile and Total
Water Content (% vol)
Strat.
Unit
USCS
Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
ALLUVIUM
UMCF-cg
UMCF-fg
SM
SM/GM
ML
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}

OU-1: M-118



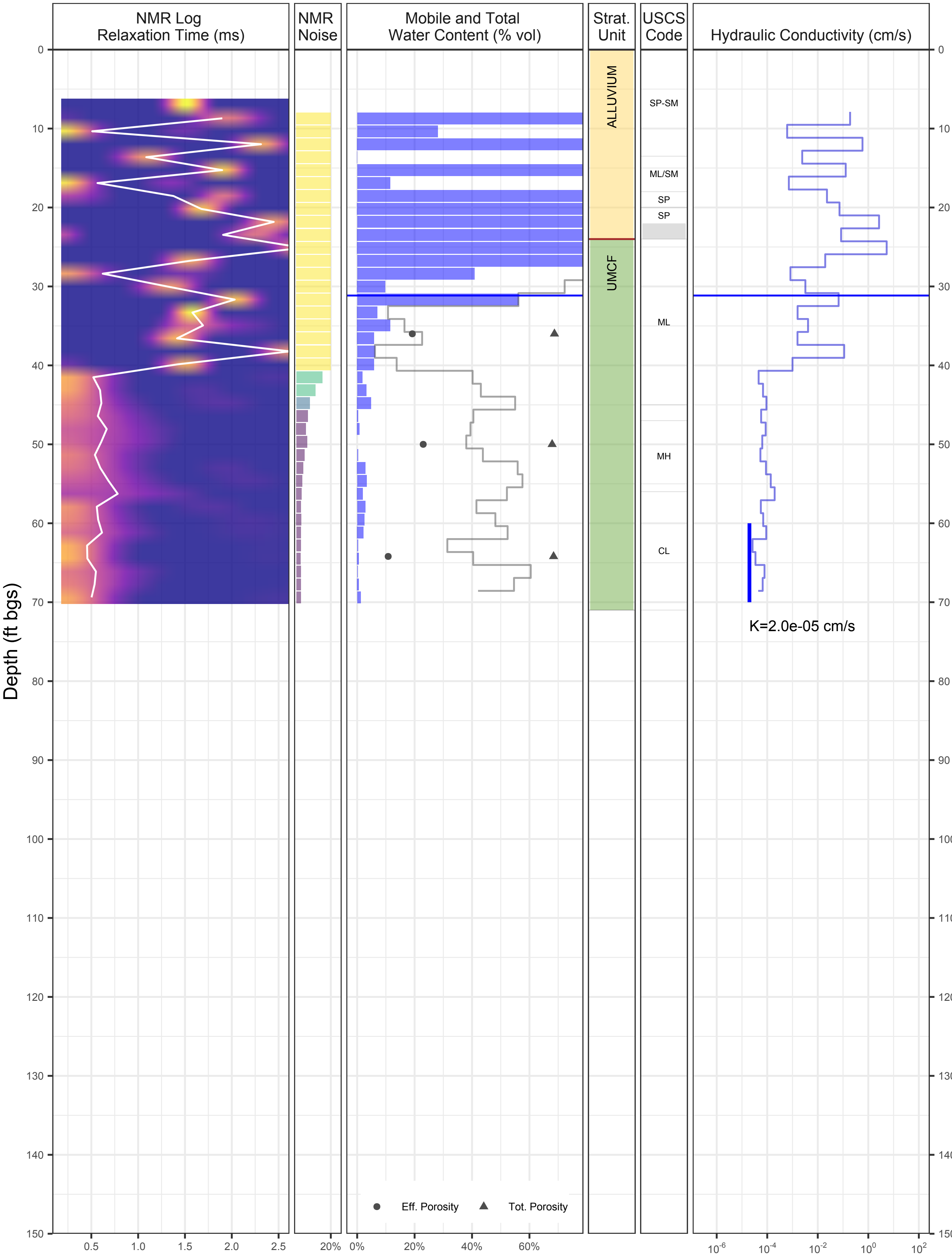
NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
150
160
170
180
190
200
210
220
230
240
250
260
270
280
290
300
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
UMCF-fg
ML
K=1.7e-05 cm/s
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}

OU-1: M-125D



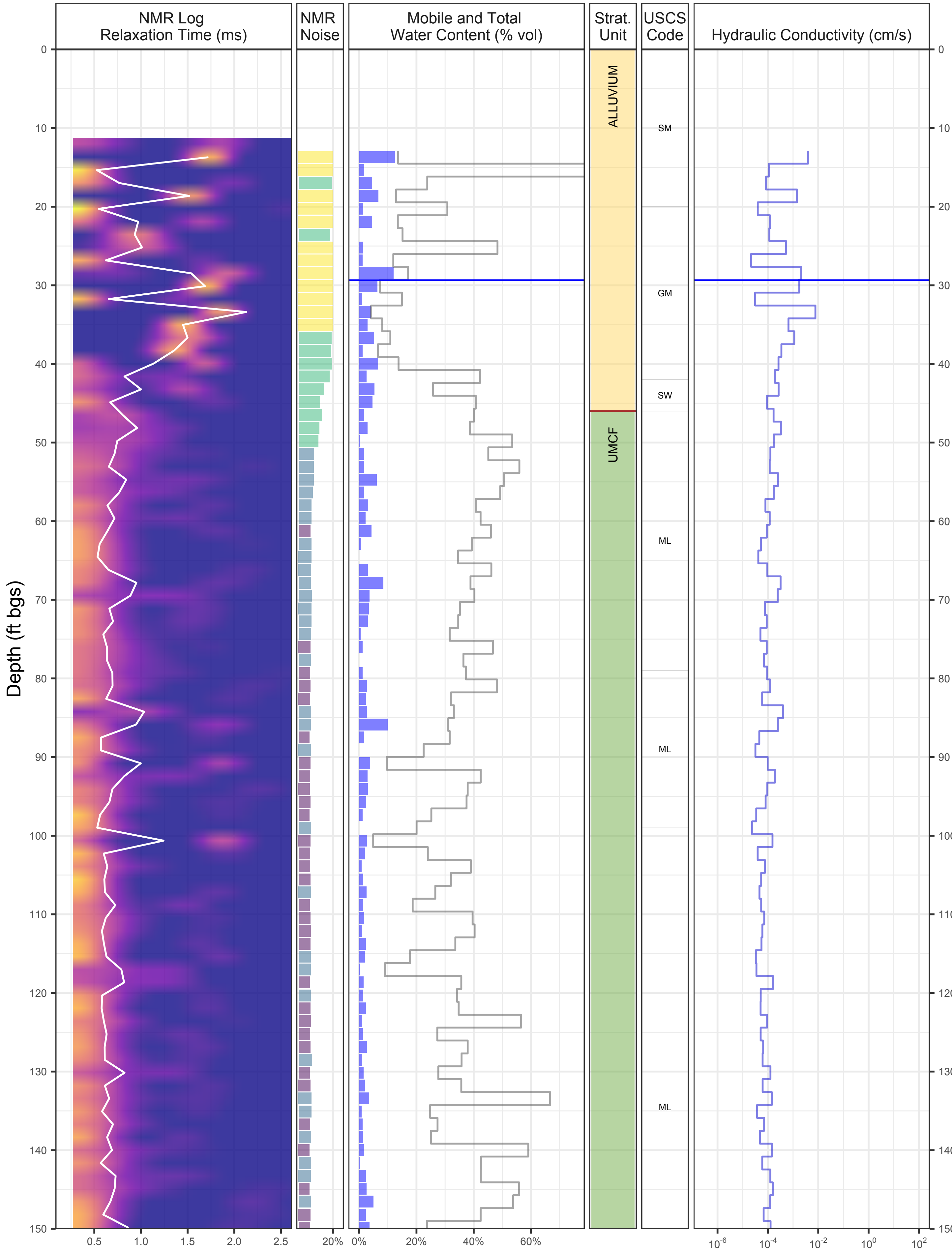
NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SP
SP-SM
ML
K=6.0e-04 cm/s
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}

OU-1: M-140D



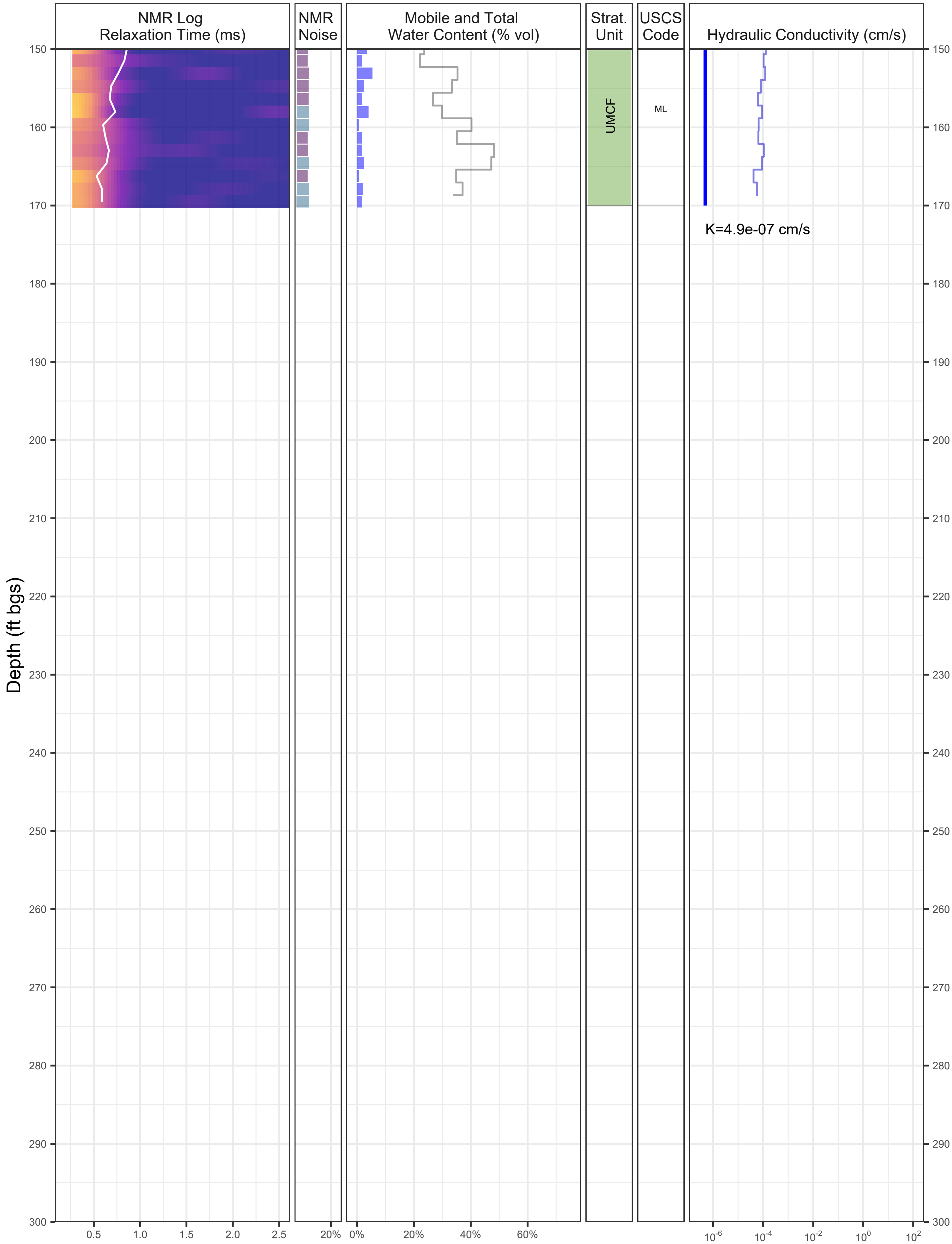
NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SP-SM
ML/SM
SP
SP
ML
MH
CL
K=2.0e-05 cm/s
Eff. Porosity
Tot. Porosity
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150

OU-1: M-153

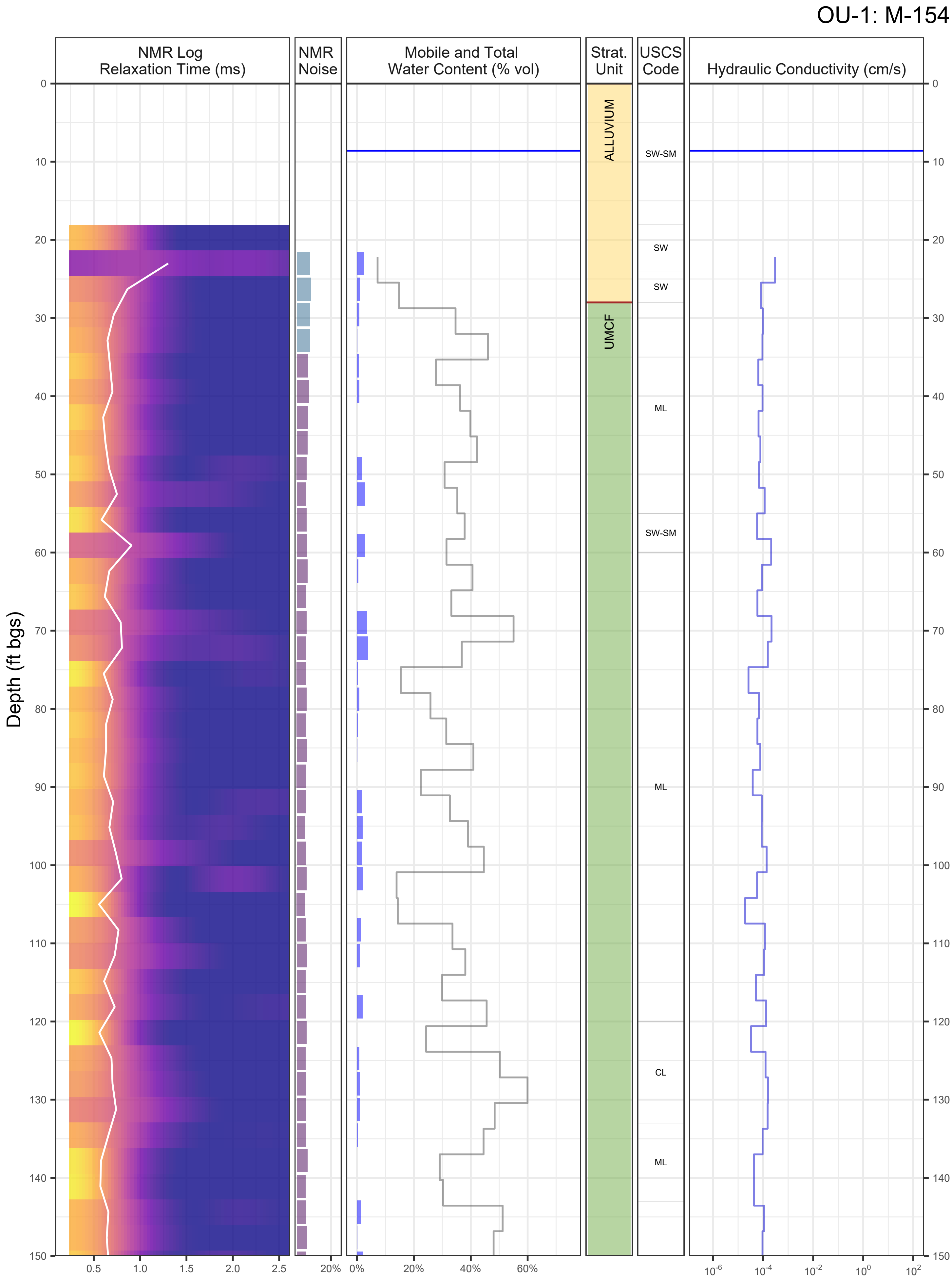


NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SM
GM
SW
ML
ML
ML
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150

OU-1: M-153

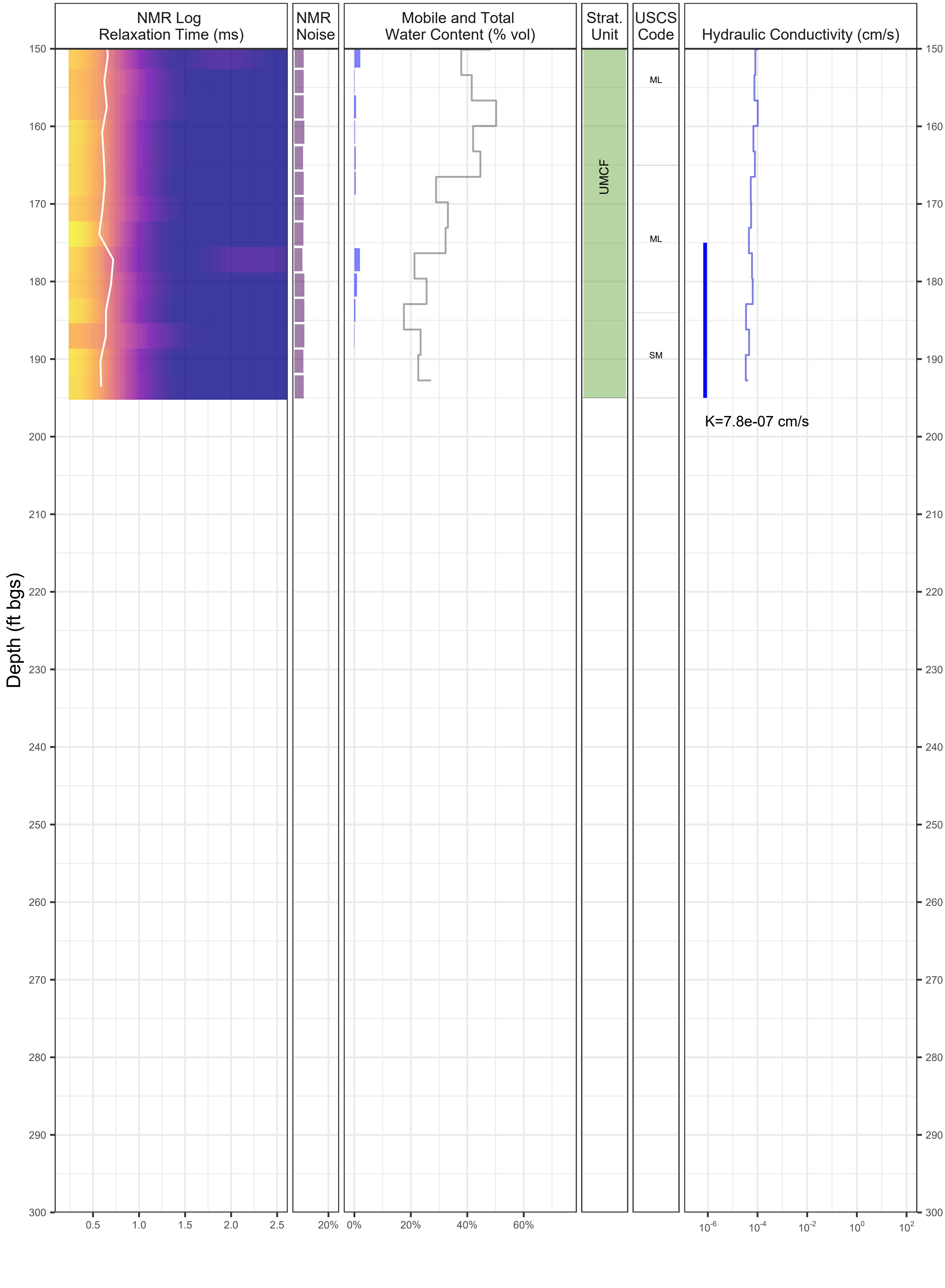


NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
UMCF
ML
K=4.9e-07 cm/s
150
160
170
180
190
200
210
220
230
240
250
260
270
280
290
300
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}

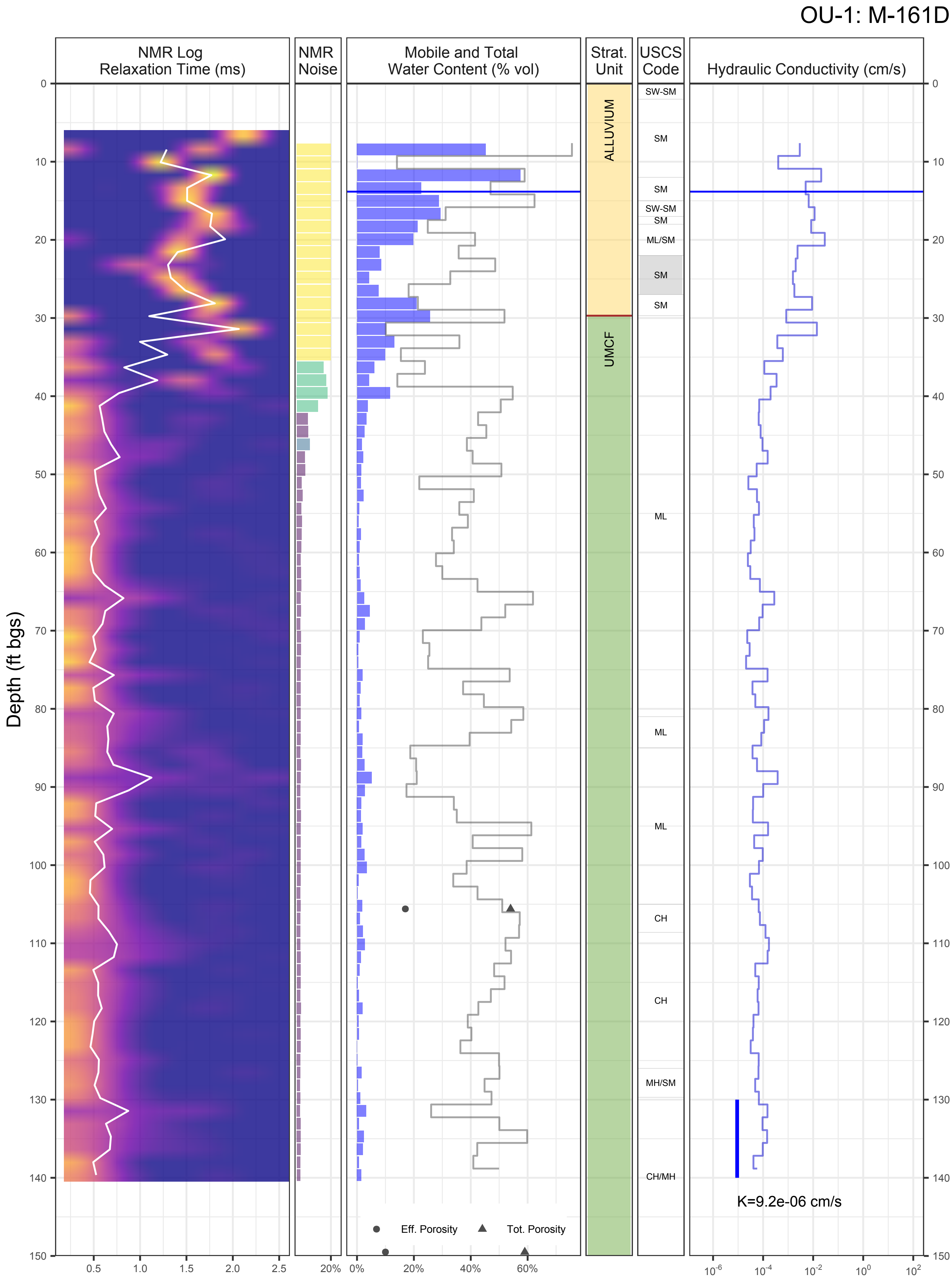


OU-1: M-154
NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SW-SM
SW
SW
ML
SW-SM
ML
CL
ML
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}

OU-1: M-154

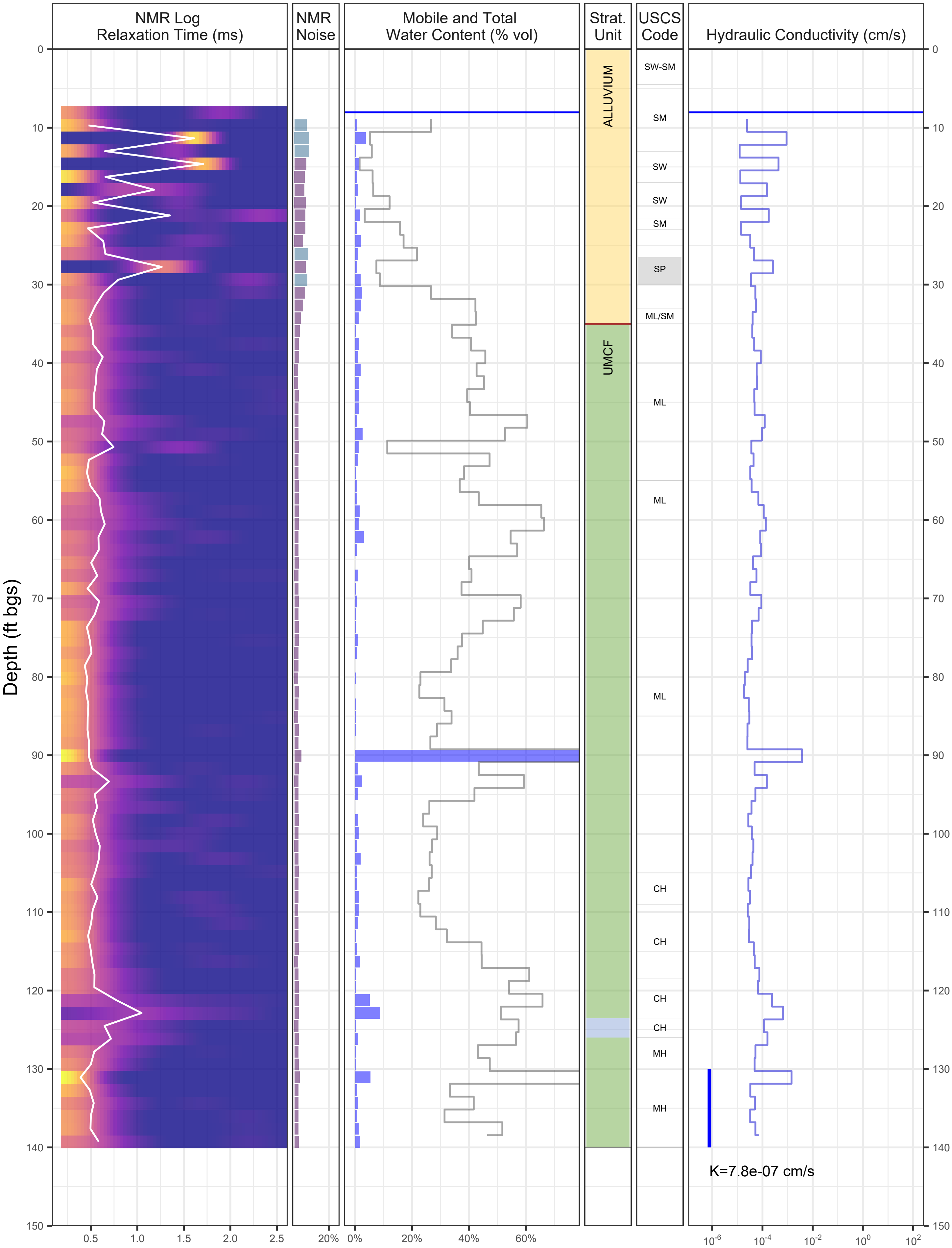


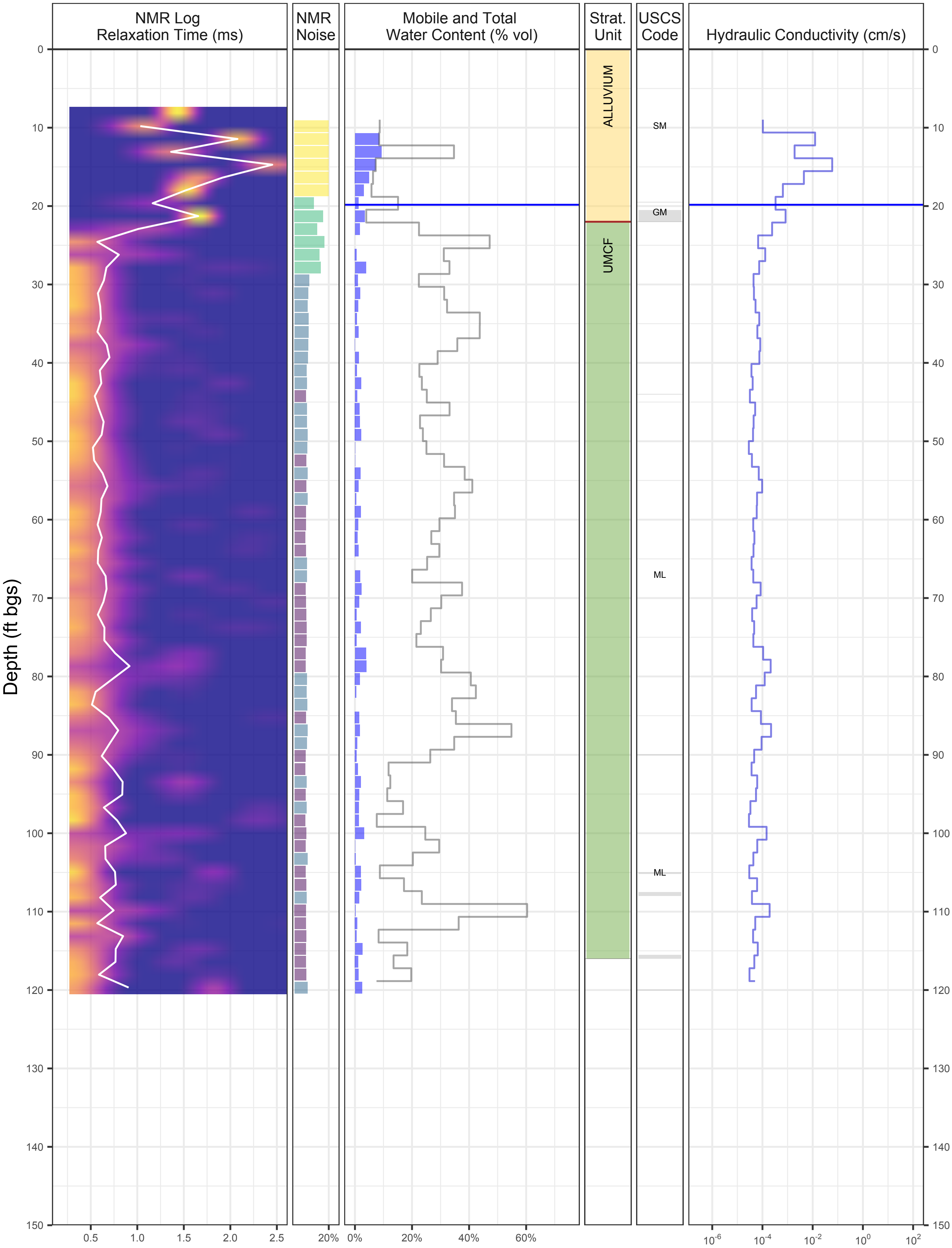
NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
150
160
170
180
190
200
210
220
230
240
250
260
270
280
290
300
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}
UMCF
ML
ML
SM
K=7.8e-07 cm/s

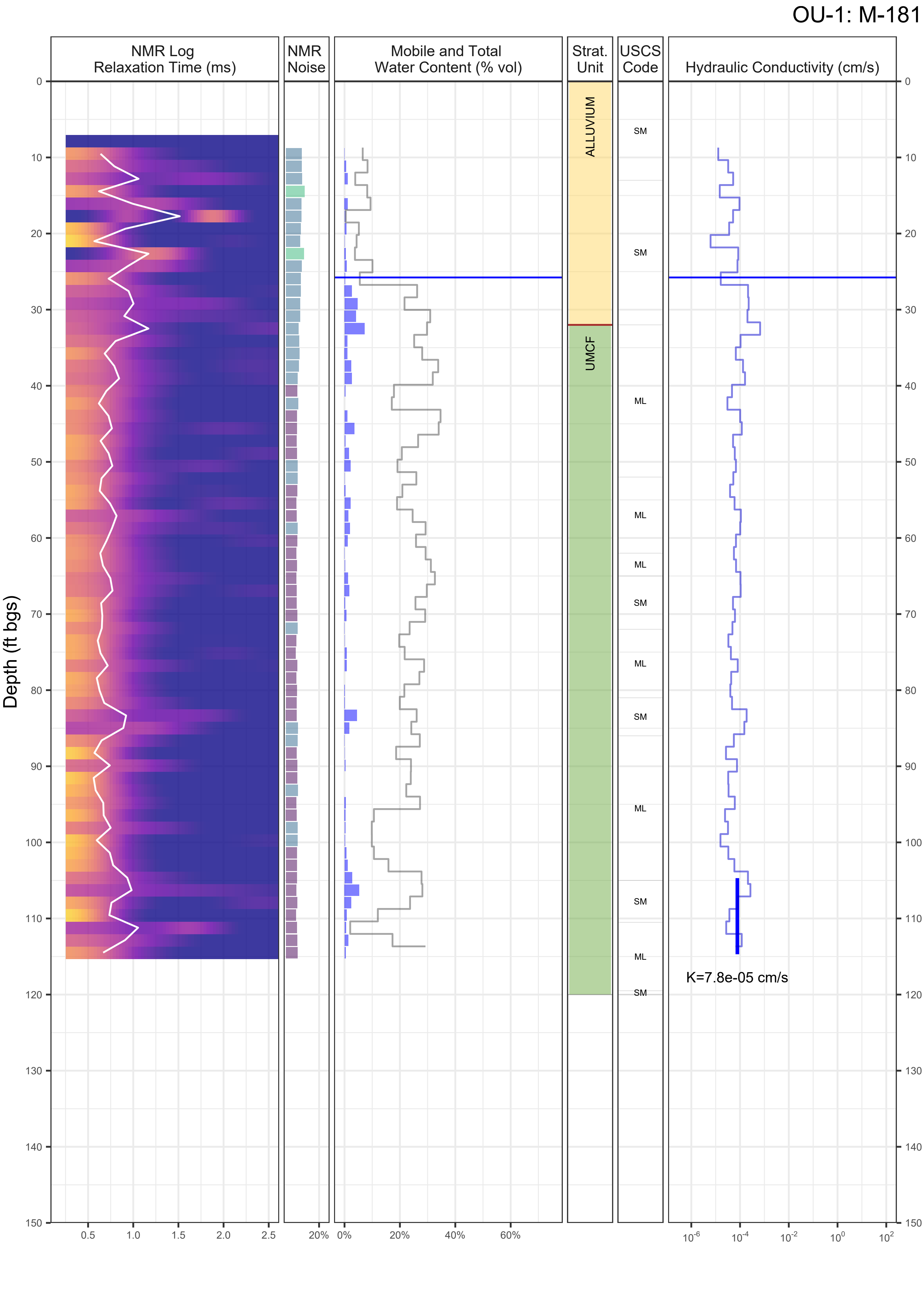


OU-1: M-161D
NMR Log Relaxation Time (ms)
NMR Noise
Mobile and Total Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SW-SM
SM
SM
SW-SM
SM
ML/SM
SM
SM
ML
ML
ML
CH
CH
MH/SM
CH/MH
K=9.2e-06 cm/s
Eff. Porosity
Tot. Porosity

OU-1: M-162D

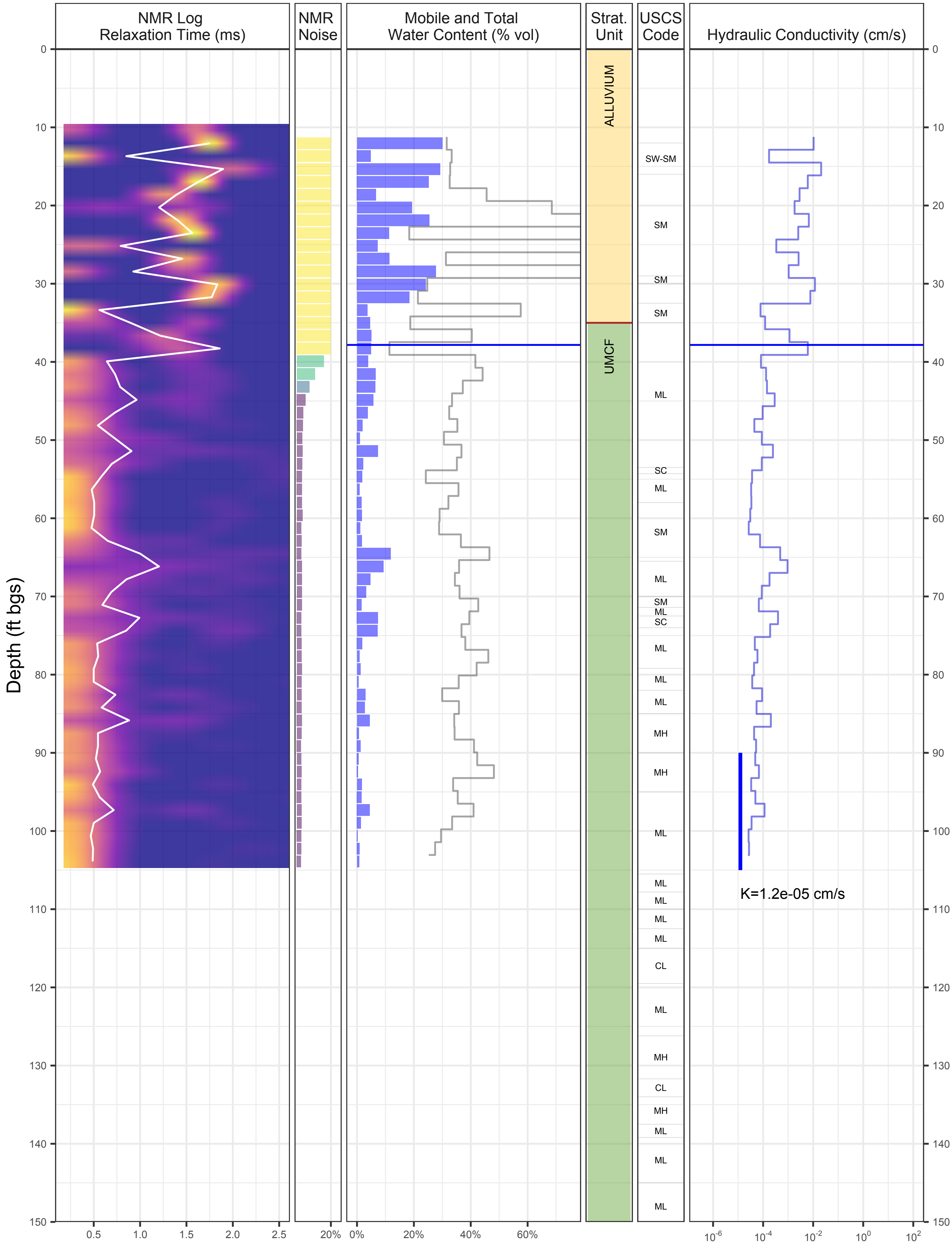

NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SW-SM
SM
SW
SW
SM
SP
ML/SM
ML
ML
ML
CH
CH
CH
CH
MH
MH
K=7.8e-07 cm/s
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}


NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SM
GM
ML
ML
0.5 1.0 1.5 2.0 2.5
20%
0% 20% 40% 60%
10^{-6} 10^{-4} 10^{-2} 10^{0} 10^{2}
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150



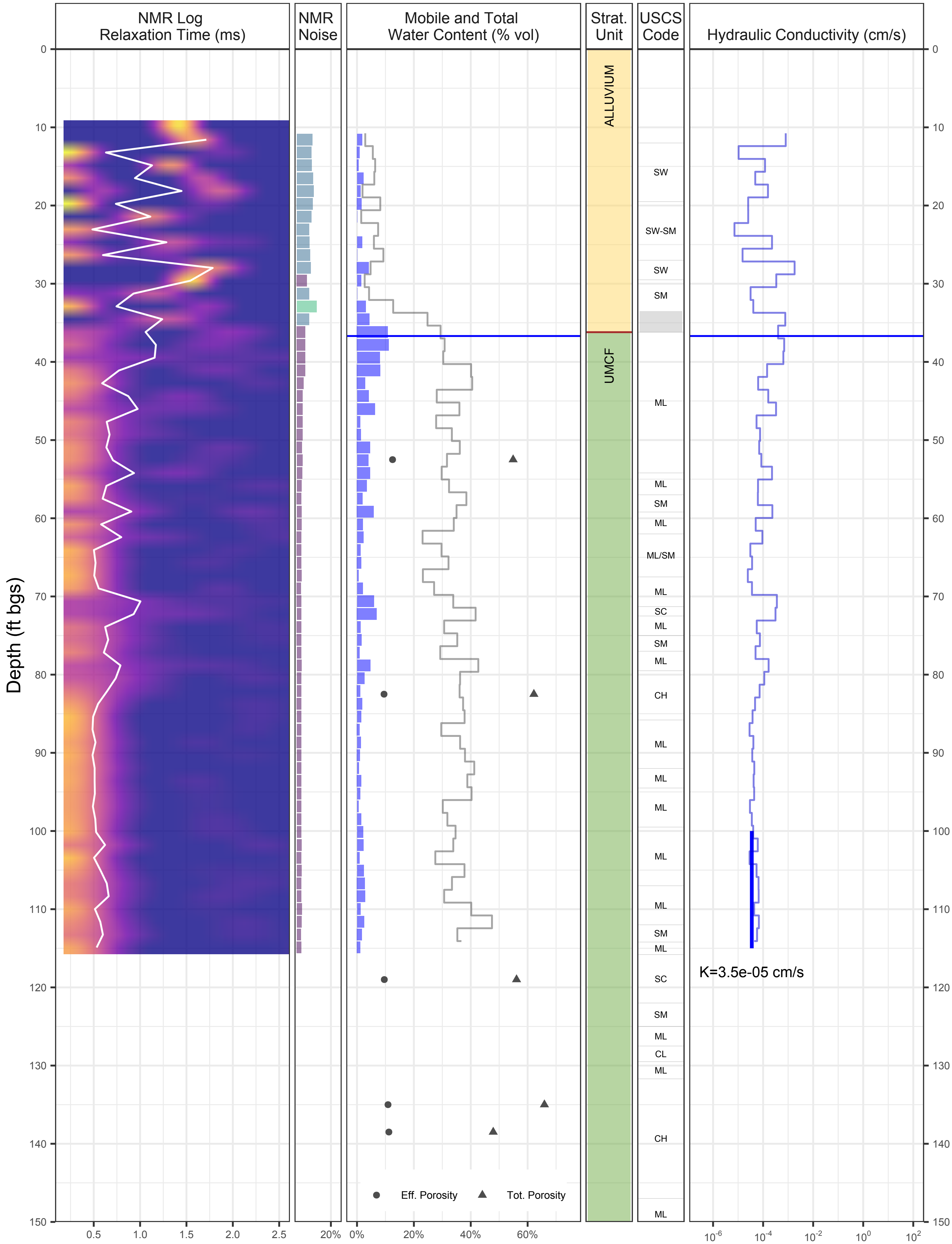
OU-1: M-181
NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SM
SM
ML
ML
ML
SM
ML
SM
ML
SM
ML
SM
K=7.8e-05 cm/s
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}

OU-1: M-196



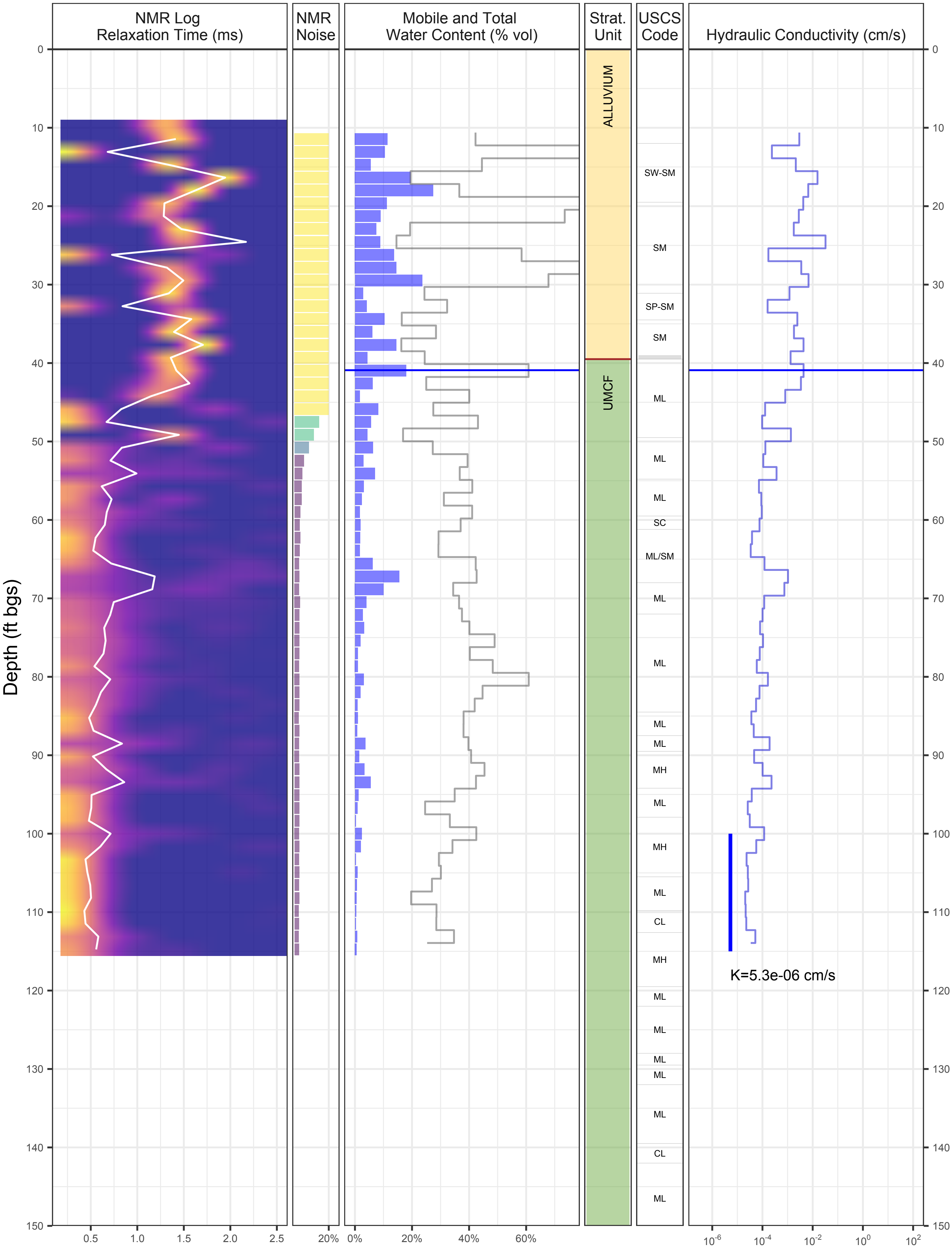
NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SW-SM
SM
SM
SM
ML
SC
ML
SM
ML
SM
ML
SC
ML
ML
ML
MH
MH
ML
ML
ML
ML
ML
CL
ML
MH
CL
MH
ML
ML
ML
K=1.2e-05 cm/s

OU-1: M-197



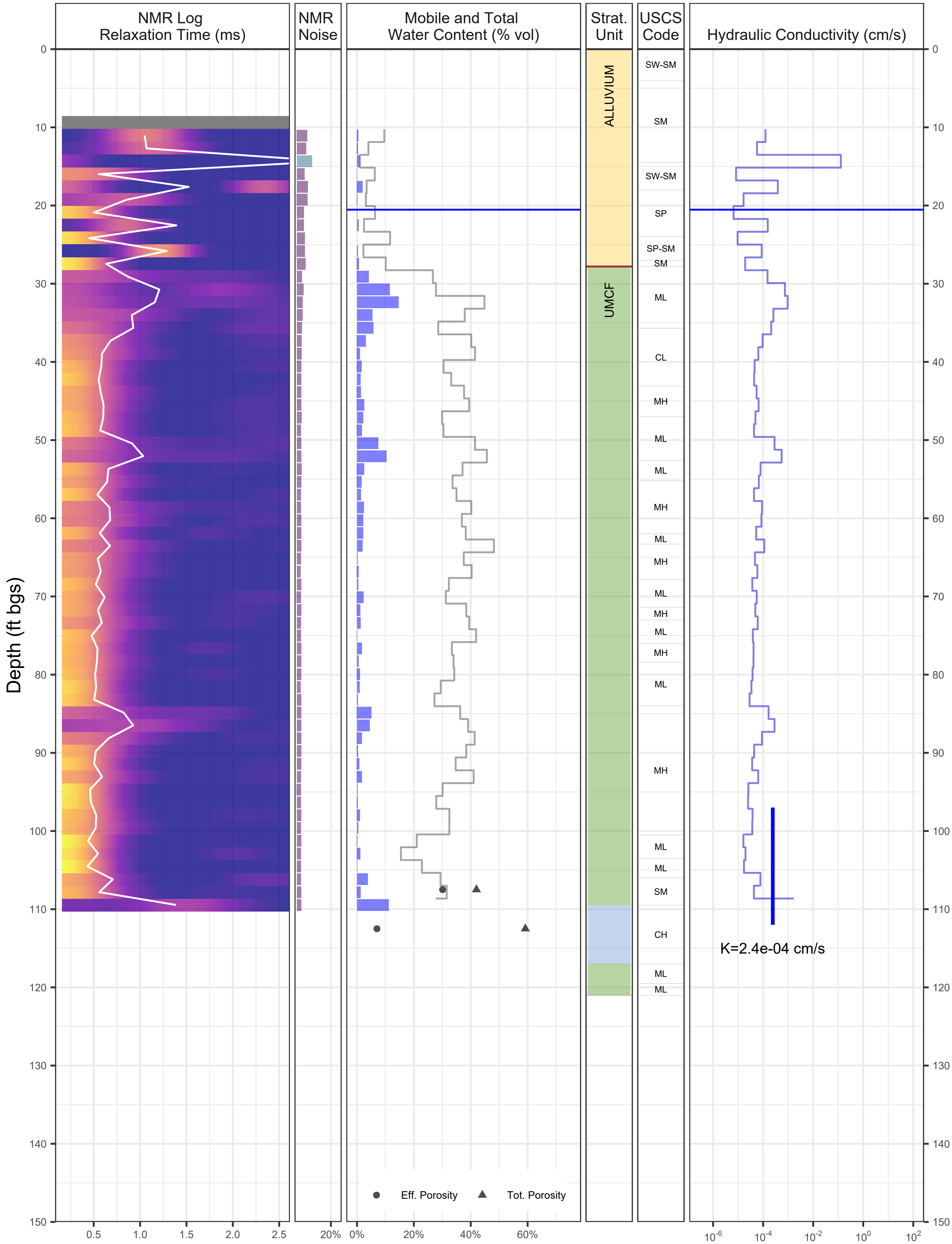
NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SW
SW-SM
SW
SM
ML
ML
SM
ML
ML/SM
ML
SC
ML
SM
ML
CH
ML
ML
ML
ML
ML
SM
ML
SC
SM
ML
CL
ML
CH
ML
K=3.5e-05 cm/s
Eff. Porosity
Tot. Porosity
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150

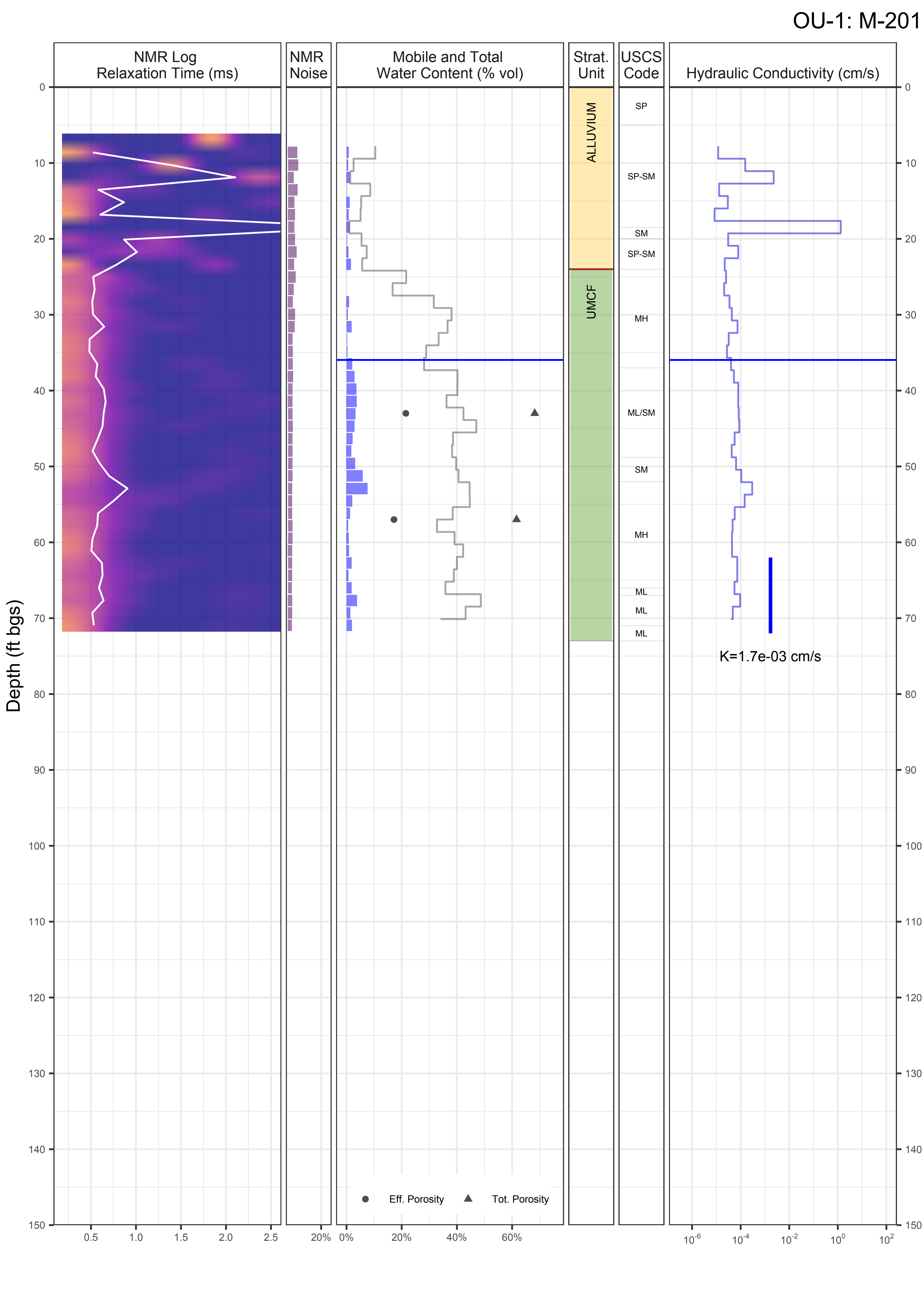
OU-1: M-198



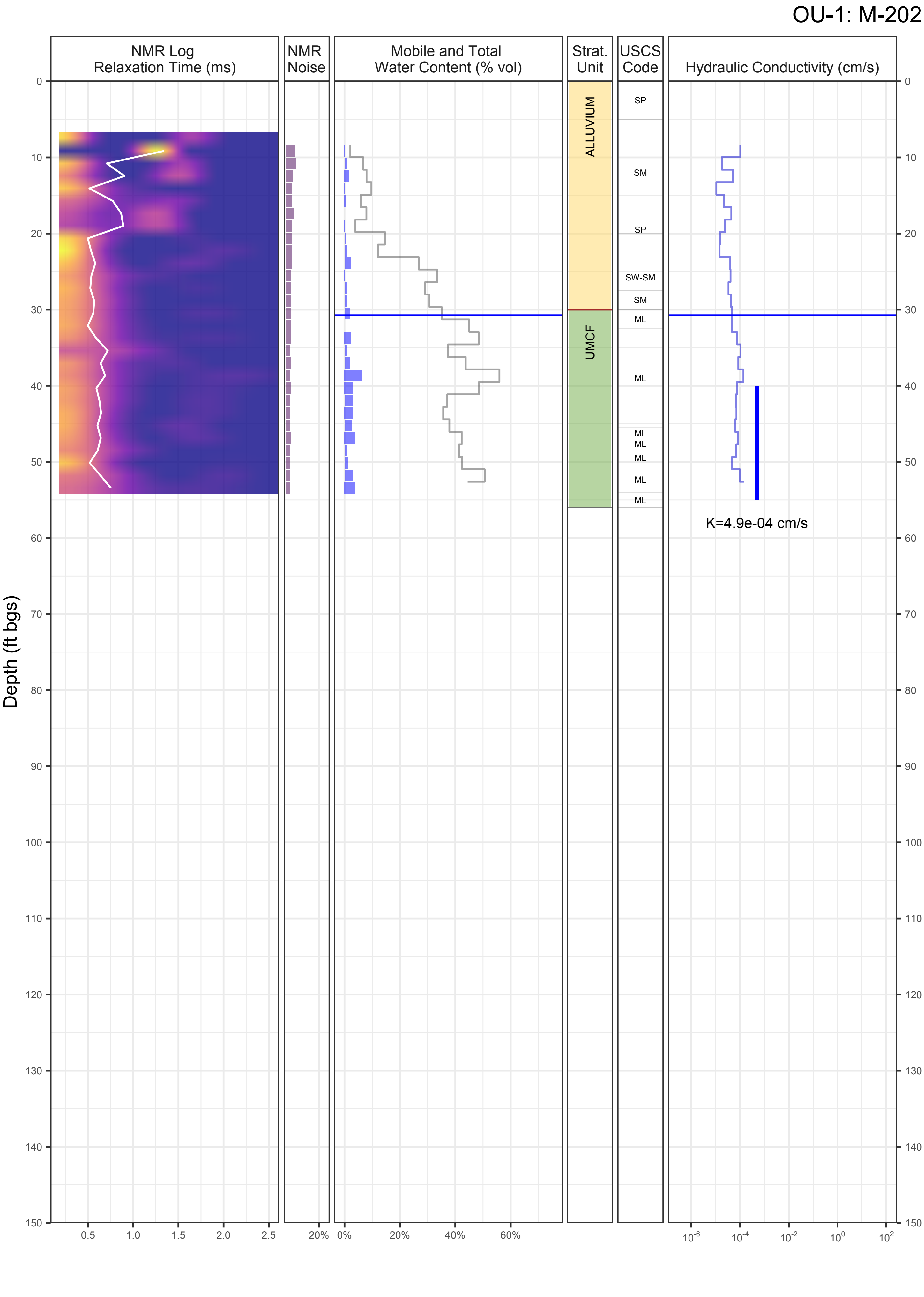
NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SW-SM
SM
SP-SM
SM
ML
ML
ML
SC
ML/SM
ML
ML
ML
ML
MH
ML
MH
ML
CL
MH
ML
ML
ML
ML
ML
CL
ML
K=5.3e-06 cm/s
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150

OU-1: M-200


NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SW-SM
SM
SW-SM
SP
SP-SM
SM
ML
CL
MH
ML
ML
MH
ML
MH
ML
MH
ML
MH
ML
MH
ML
ML
SM
CH
ML
ML
K=2.4e-04 cm/s
Eff. Porosity
Tot. Porosity
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}

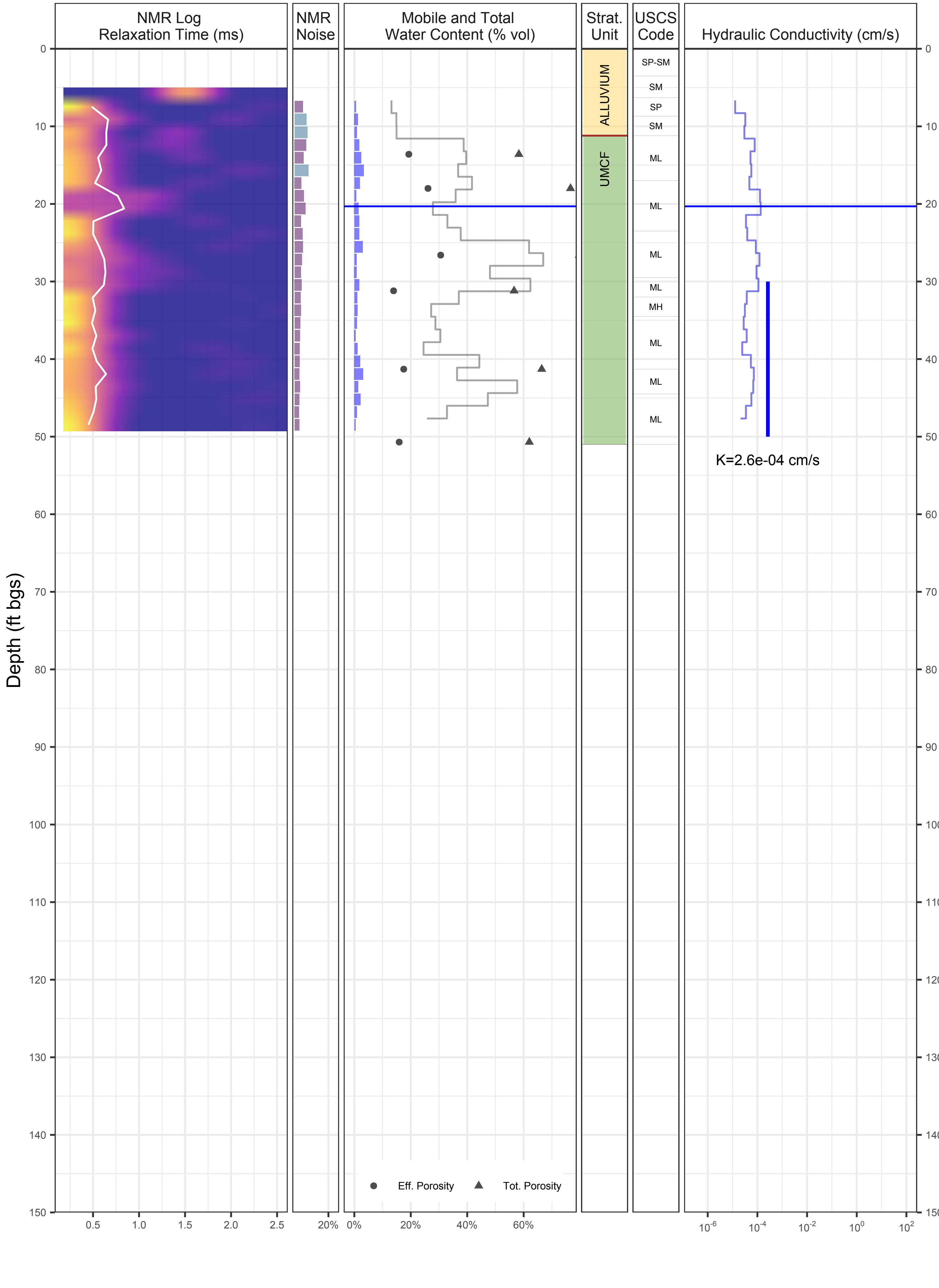


OU-1: M-201
NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SP
SP-SM
SM
SP-SM
MH
ML/SM
SM
MH
ML
ML
ML
K=1.7e-03 cm/s
Eff. Porosity
Tot. Porosity



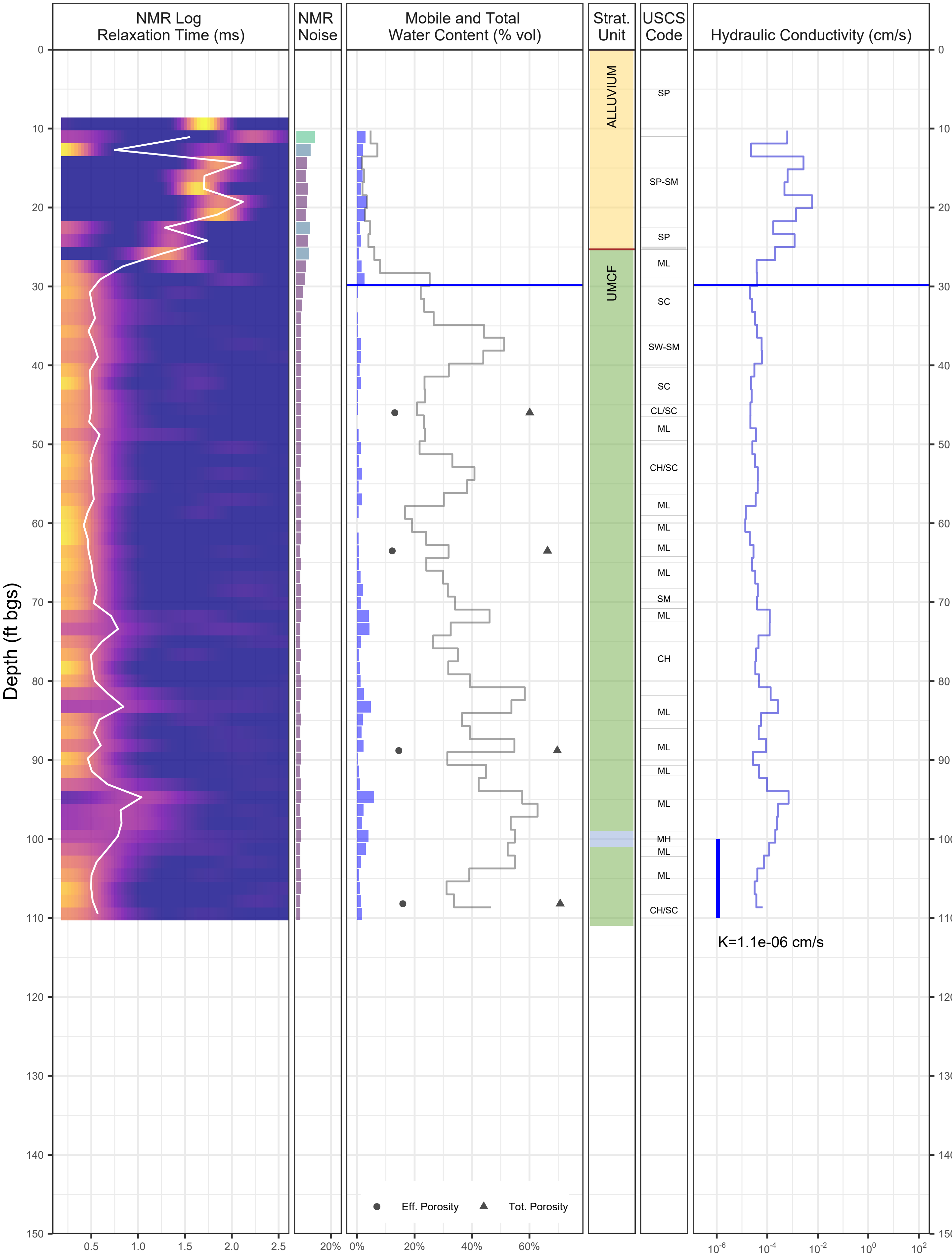
OU-1: M-202
NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SP
SM
SP
SW-SM
SM
ML
ML
ML
ML
ML
ML
ML
K=4.9e-04 cm/s
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}

OU-1: M-203



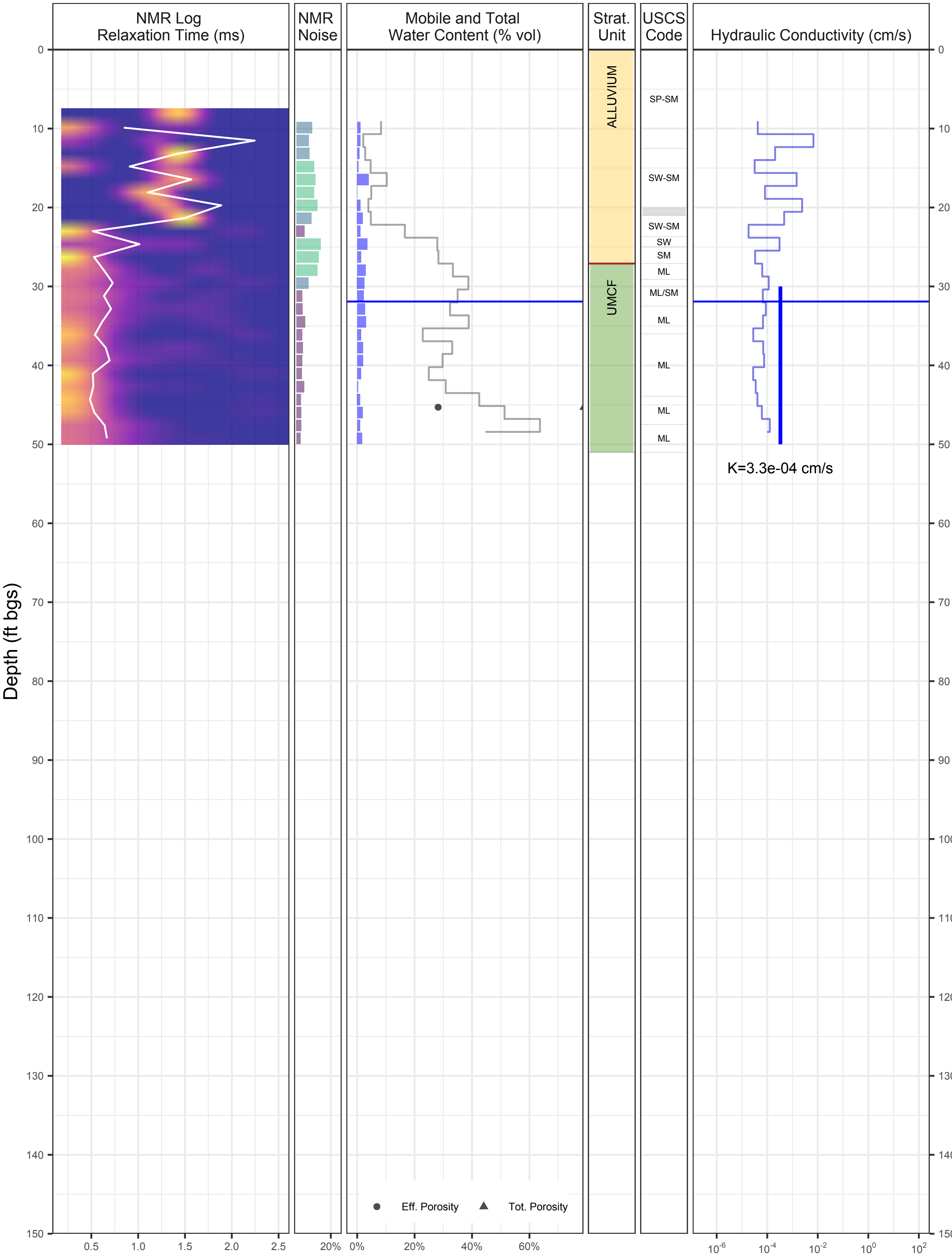
NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SP-SM
SM
SP
SM
ML
ML
ML
ML
MH
ML
ML
ML
K=2.6e-04 cm/s
Eff. Porosity
Tot. Porosity
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150

OU-1: M-204



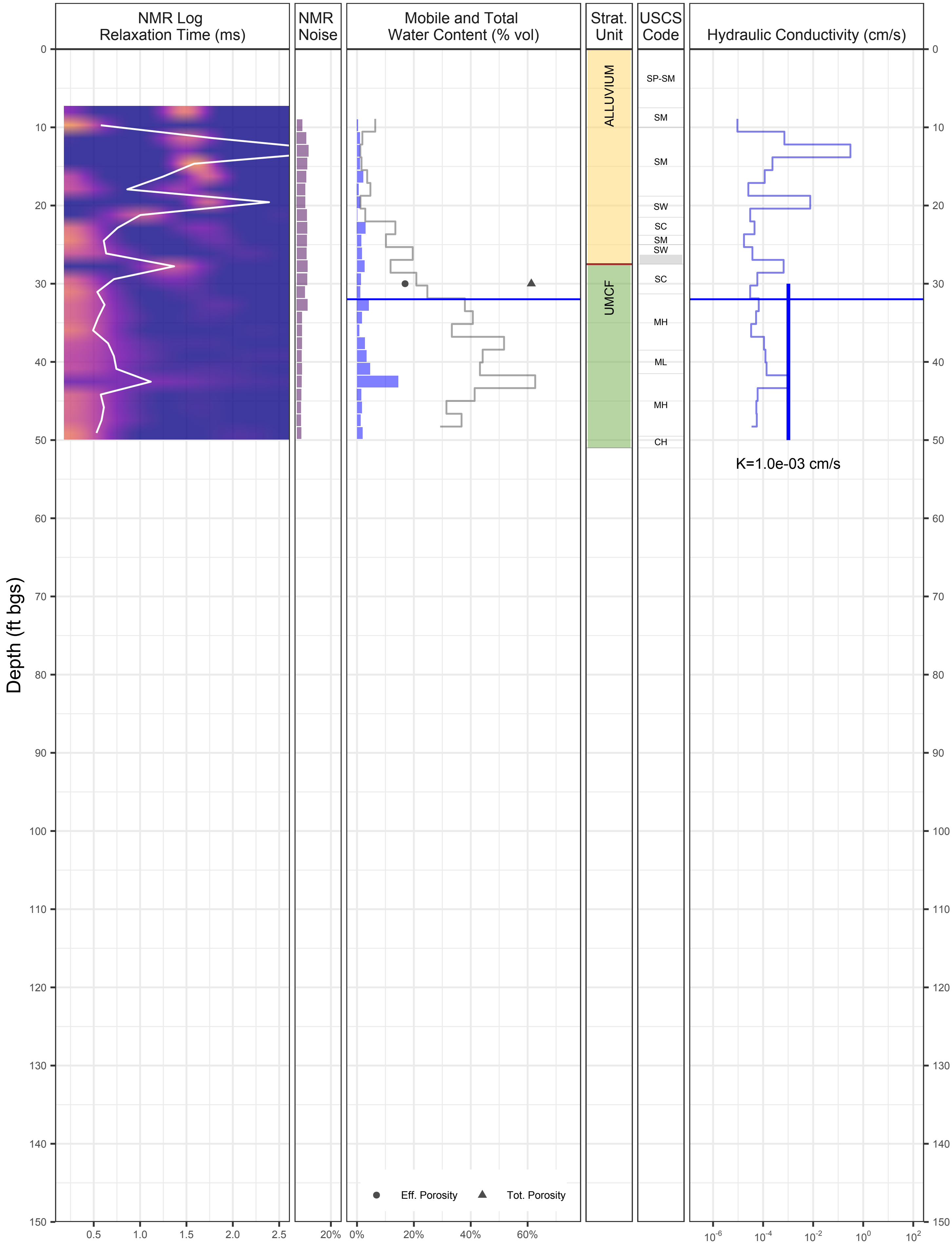
NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SP
SP-SM
SP
ML
SC
SW-SM
SC
CL/SC
ML
CH/SC
ML
ML
ML
ML
SM
ML
CH
ML
ML
ML
ML
MH
ML
ML
CH/SC
K=1.1e-06 cm/s
Eff. Porosity
Tot. Porosity
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}

OU-1: M-205



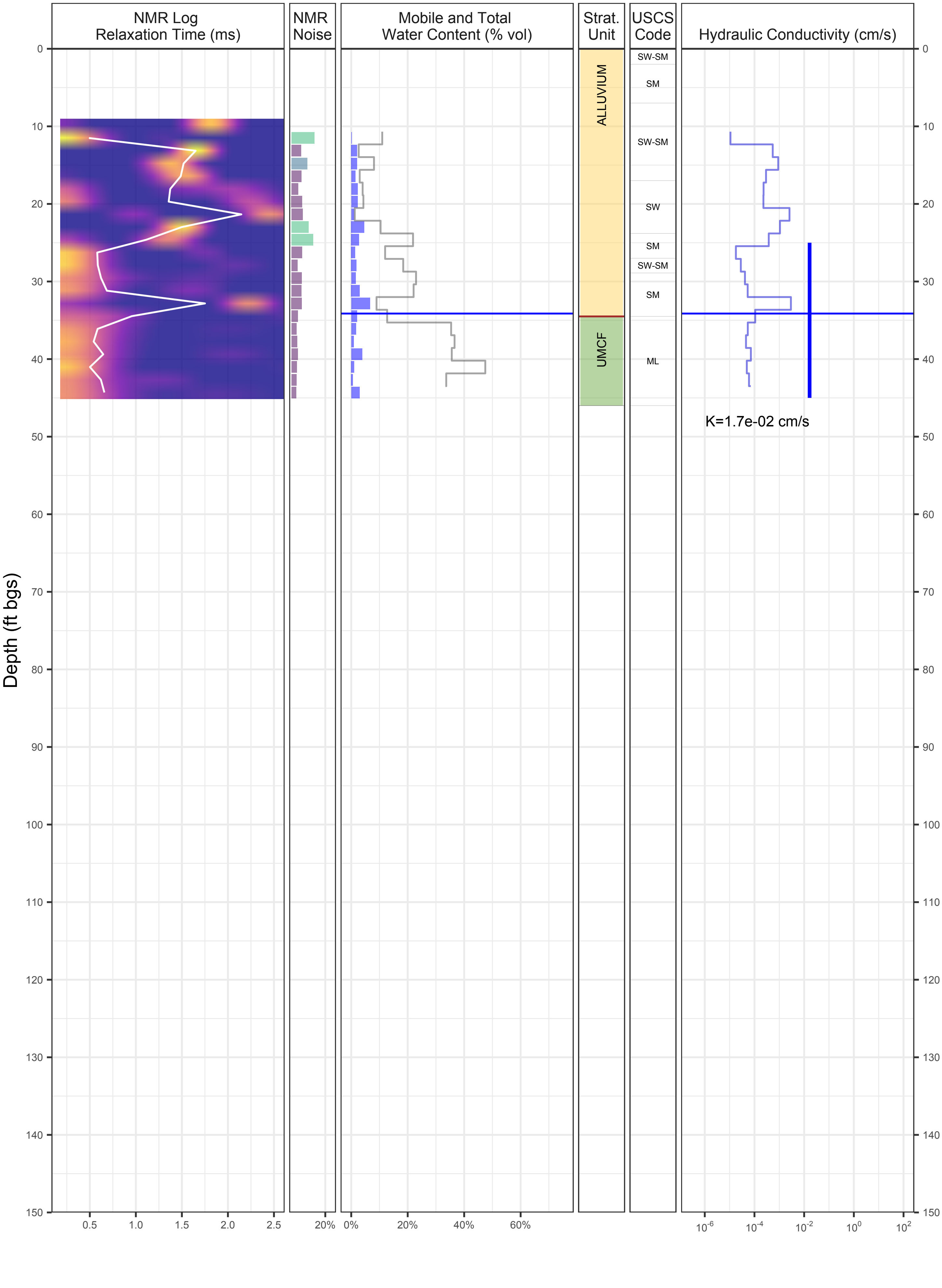
NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SP-SM
SW-SM
SW-SM
SW
SM
ML
ML/SM
ML
ML
ML
ML
K=3.3e-04 cm/s
Eff. Porosity
Tot. Porosity
0.5 1.0 1.5 2.0 2.5
20%
0% 20% 40% 60%
10^{-6} 10^{-4} 10^{-2} 10^{0} 10^{2}
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

OU-1: M-206



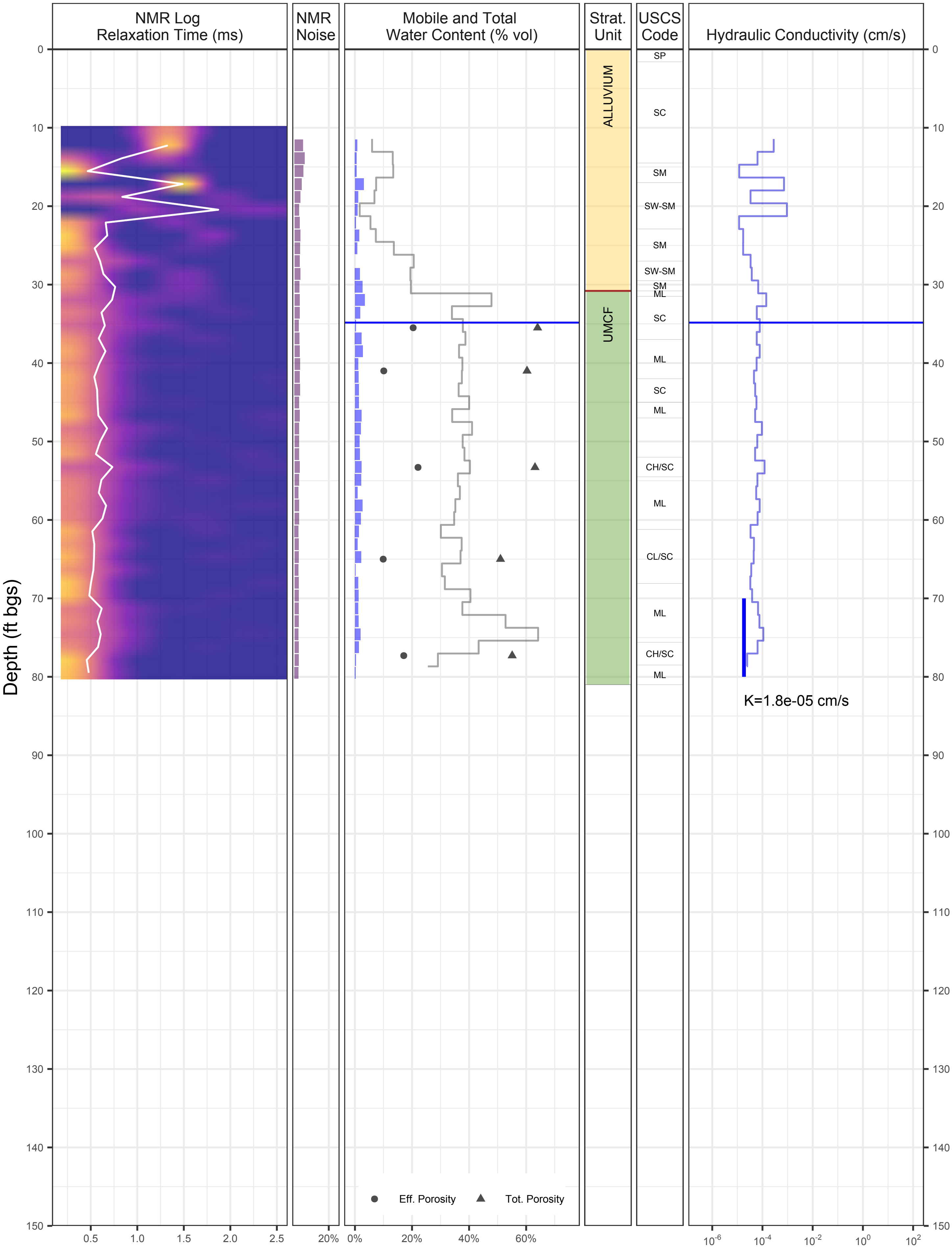
NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SP-SM
SM
SM
SW
SC
SM
SW
SC
MH
ML
MH
CH
K=1.0e-03 cm/s
Eff. Porosity
Tot. Porosity
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150

OU-1: M-207



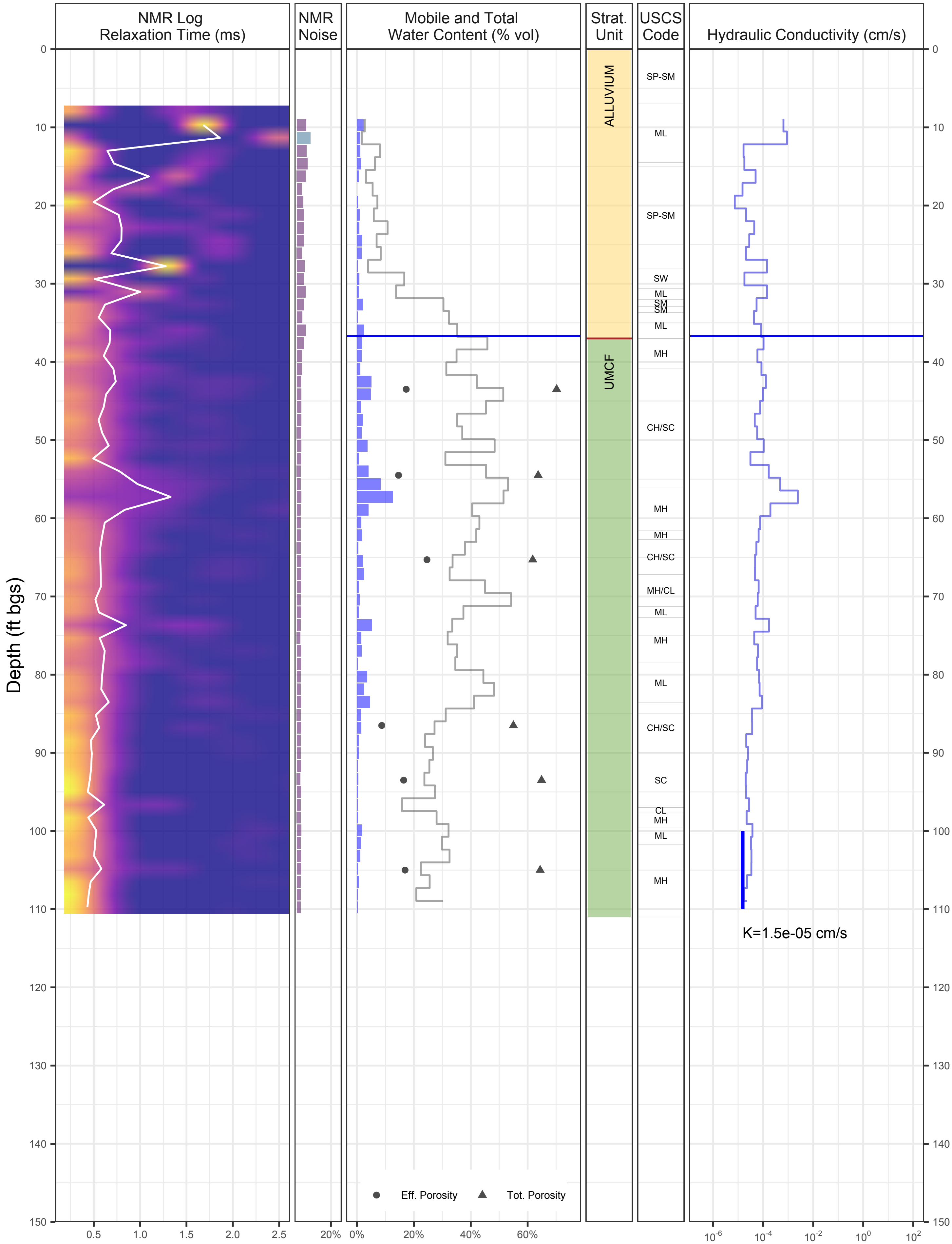
NMR Log
Relaxation Time (ms)
NMR
Noise
Mobile and Total
Water Content (% vol)
Strat.
Unit
USCS
Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SW-SM
SM
SW-SM
SW
SM
SW-SM
SM
ML
K=1.7e-02 cm/s
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}

OU-1: M-210

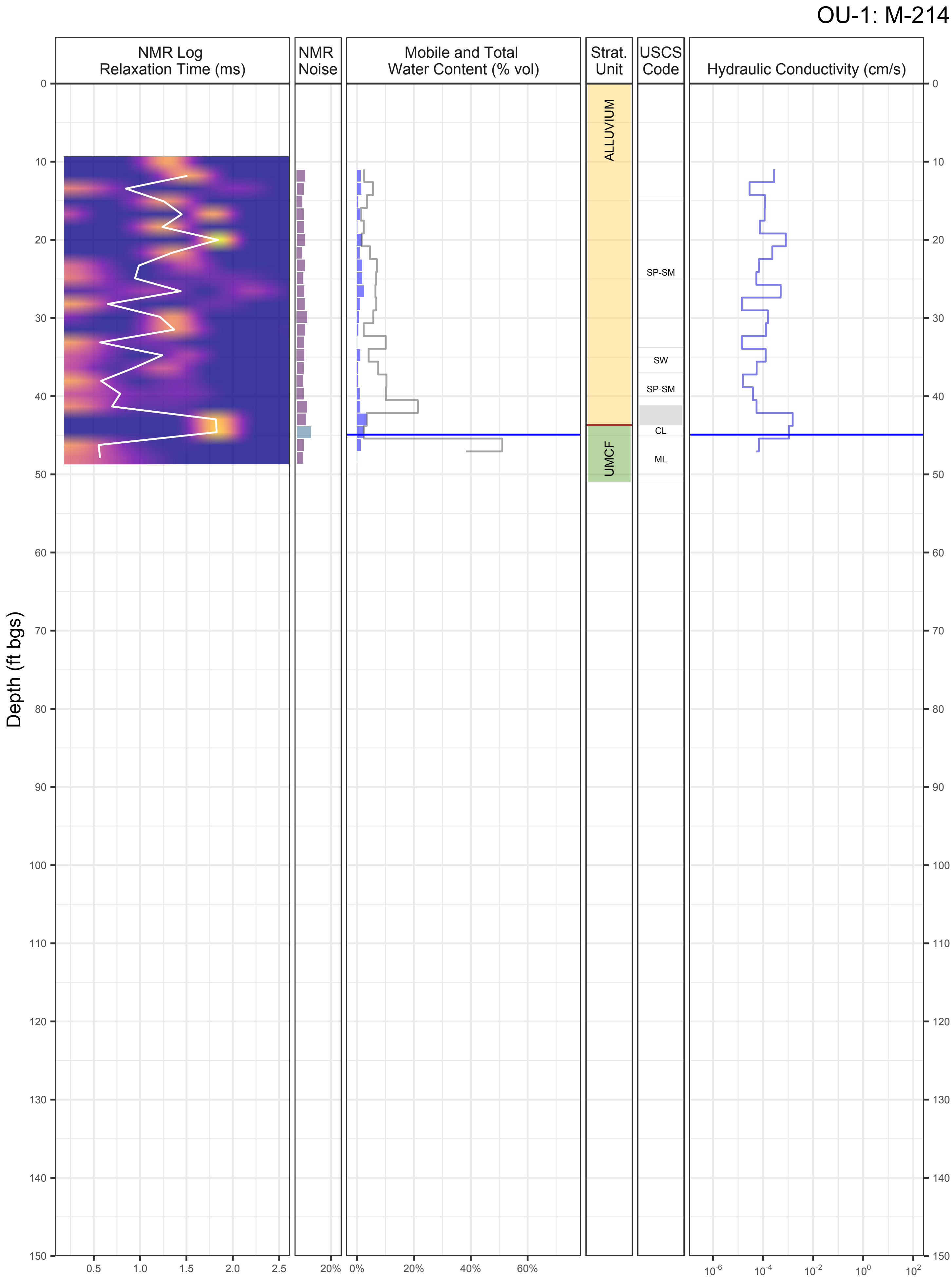


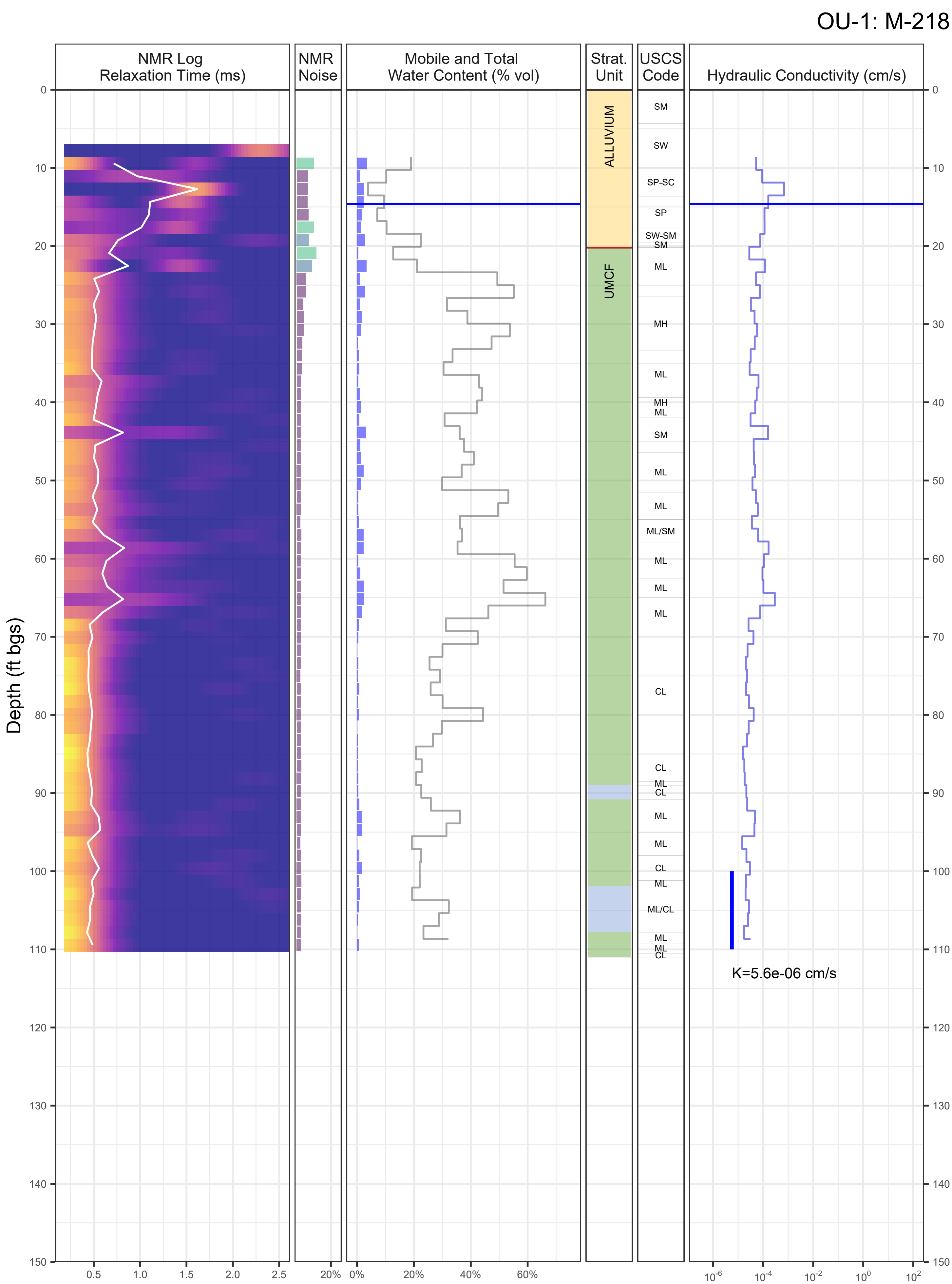
NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SP
SC
SM
SW-SM
SM
SW-SM
SM
ML
SC
ML
SC
ML
CH/SC
ML
CL/SC
ML
CH/SC
ML
K=1.8e-05 cm/s
Eff. Porosity
Tot. Porosity
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150

OU-1: M-213

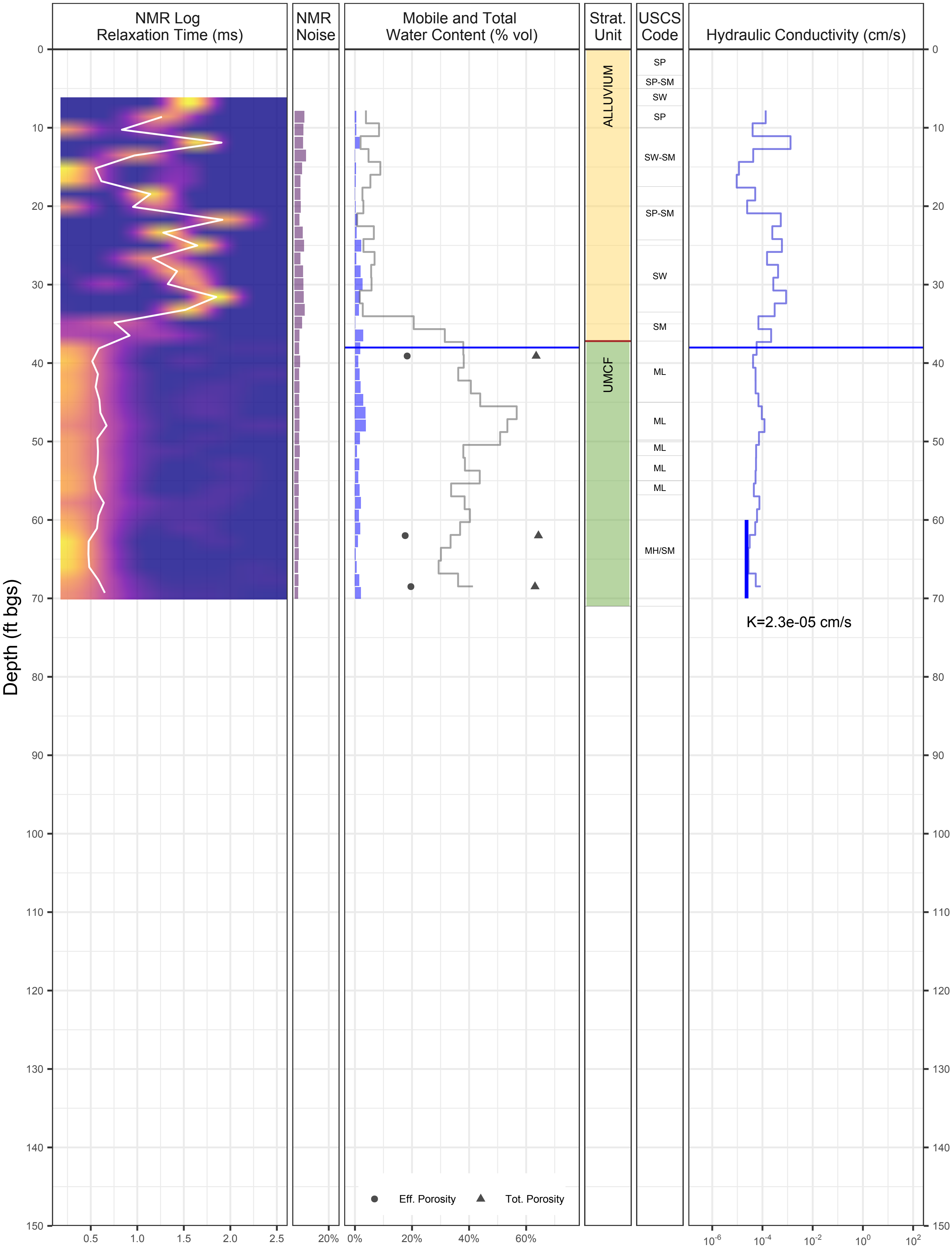


NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
ALLUVIUM
UMCF
SP-SM
ML
SP-SM
SW
ML
SM
SM
ML
MH
CH/SC
MH
MH
CH/SC
MH/CL
ML
MH
ML
CH/SC
SC
CL
MH
ML
MH
Eff. Porosity
Tot. Porosity
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}
K=1.5e-05 cm/s

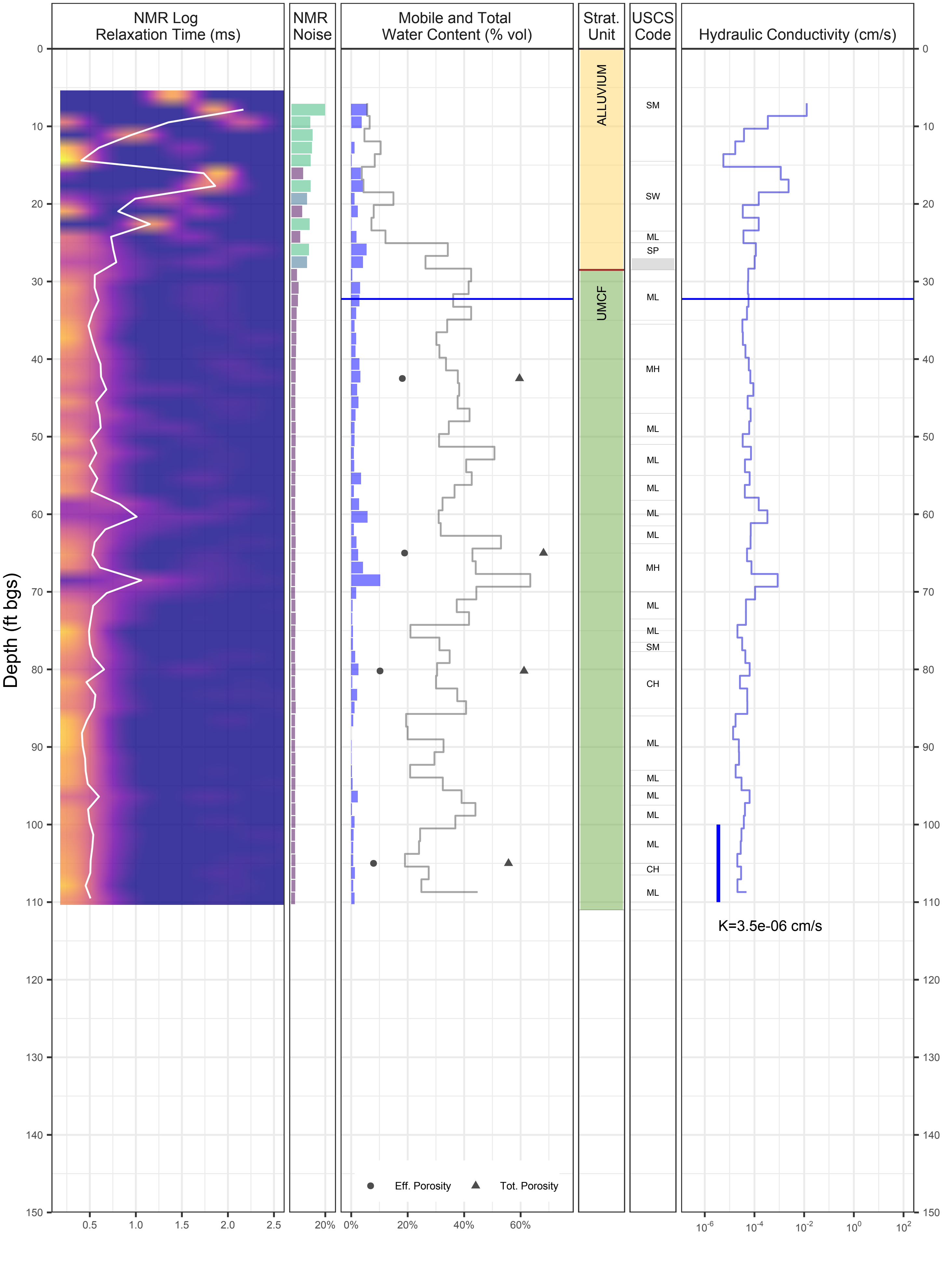

OU-1: M-214
NMR Log
Relaxation Time (ms)
NMR
Noise
Mobile and Total
Water Content (% vol)
Strat.
Unit
USCS
Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SP-SM
SW
SP-SM
CL
ML
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}

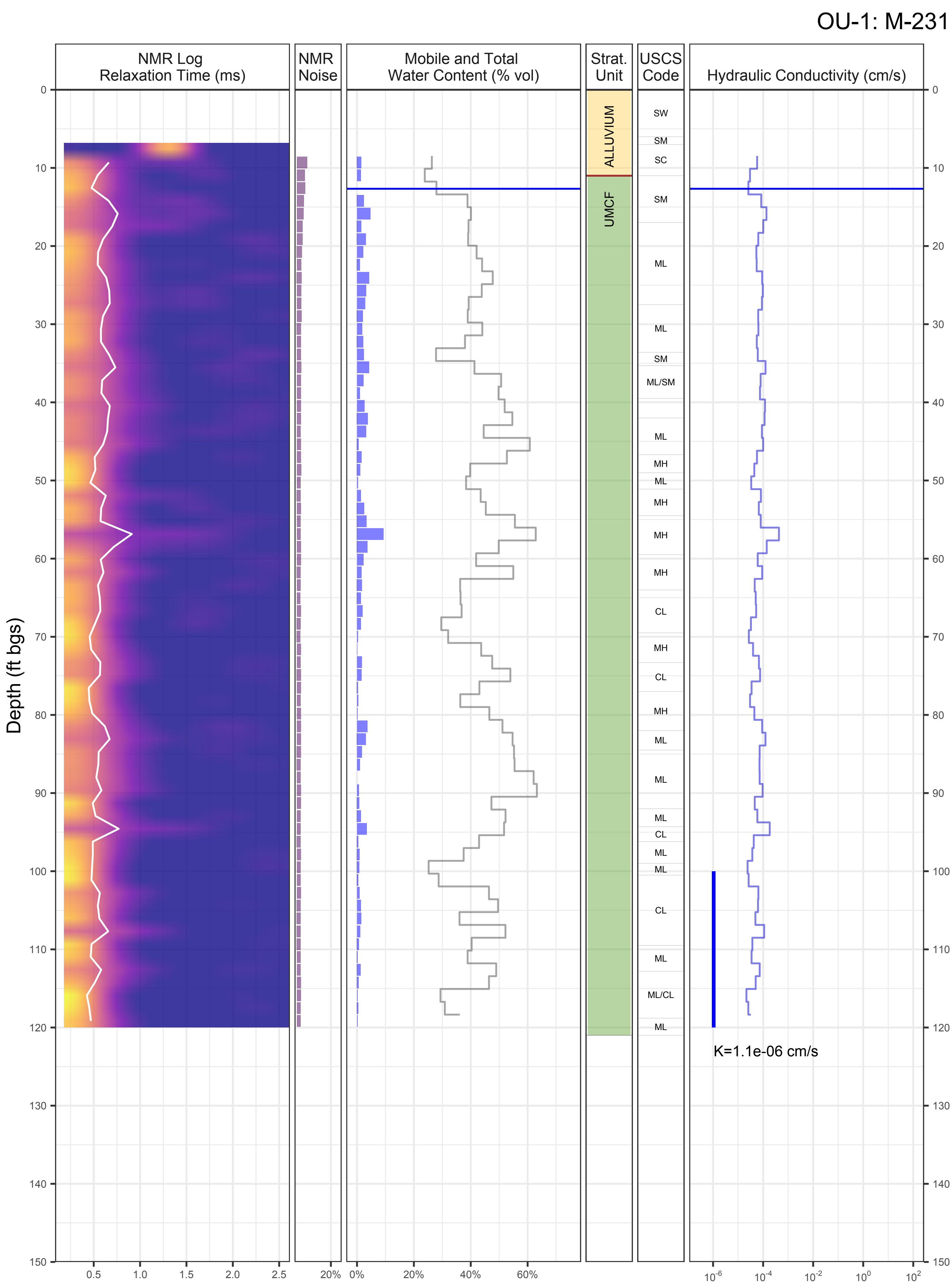

OU-1: M-218
NMR Log
Relaxation Time (ms)
NMR
Noise
Mobile and Total
Water Content (% vol)
Strat.
Unit
USCS
Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SM
SW
SP-SC
SP
SW-SM
SM
ML
MH
ML
MH
ML
SM
ML
ML
ML/SM
ML
ML
ML
CL
CL
ML
CL
ML
ML
CL
ML
ML/CL
ML
ML
CL
K=5.6e-06 cm/s
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}

OU-1: M-220

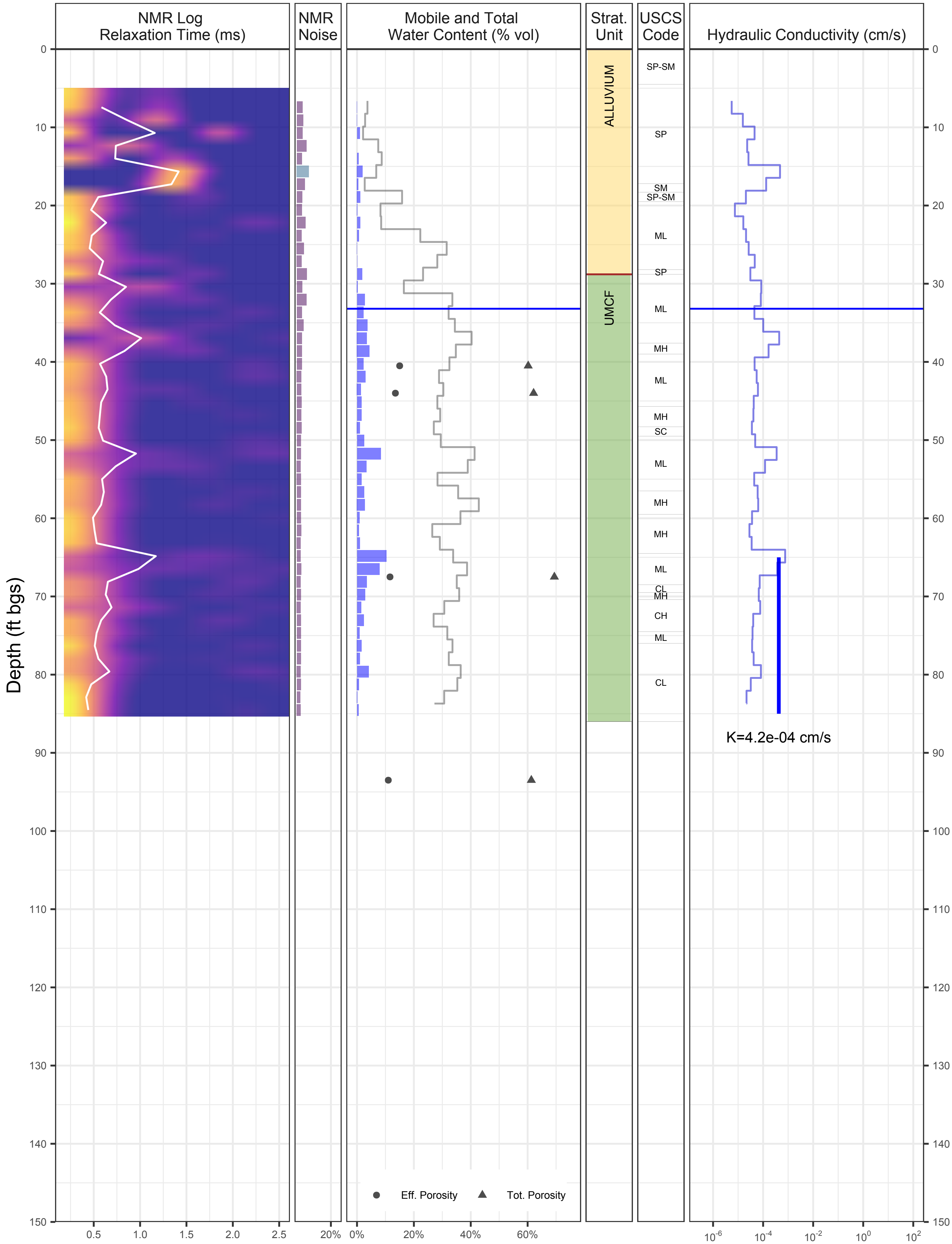

NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SP
SP-SM
SW
SP
SW-SM
SP-SM
SW
SM
ML
ML
ML
ML
ML
MH/SM
K=2.3e-05 cm/s
Eff. Porosity
Tot. Porosity

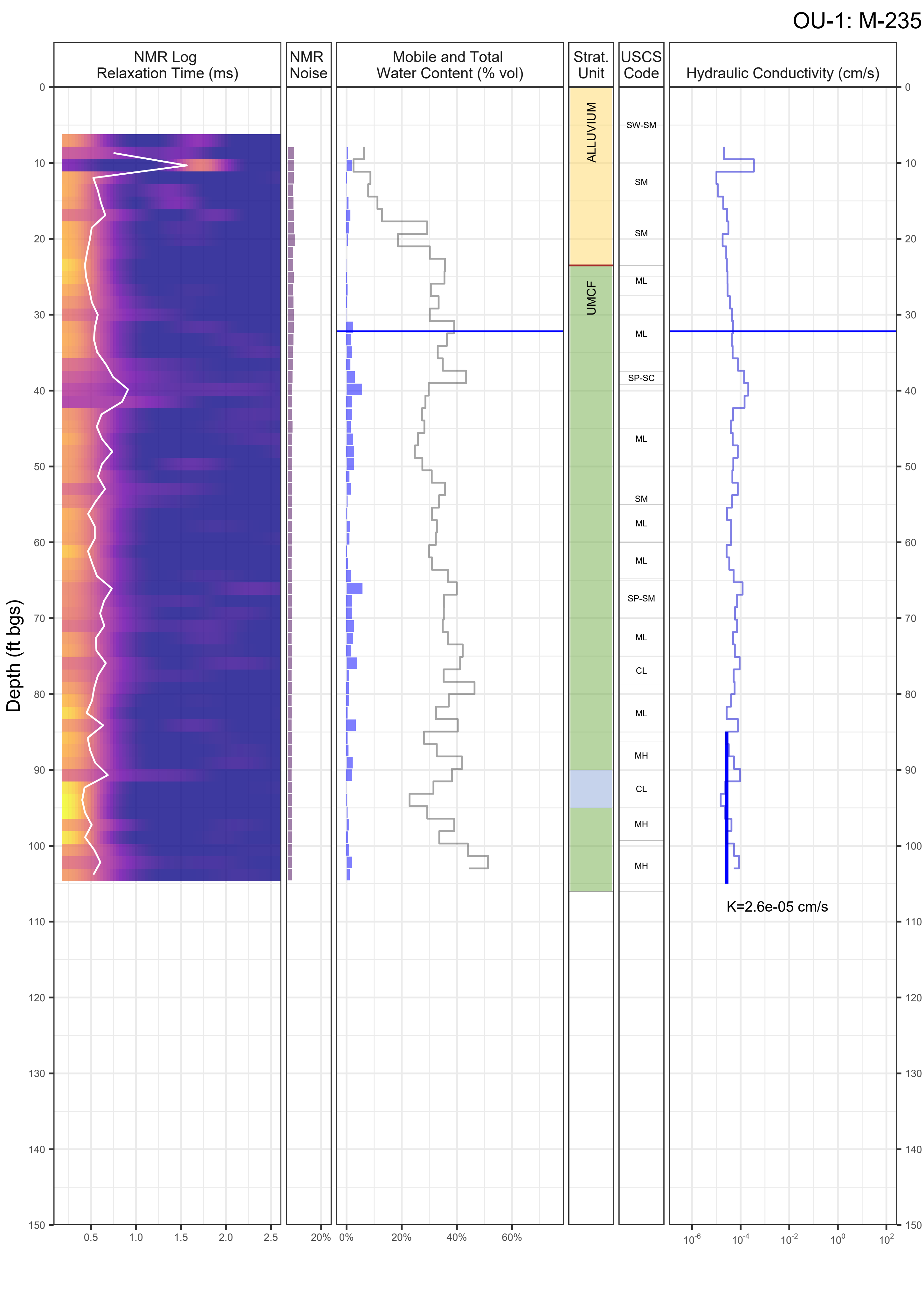
OU-1: M-222


NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SM
SW
ML
SP
ML
MH
ML
ML
ML
ML
ML
MH
ML
ML
SM
CH
ML
ML
ML
ML
ML
CH
ML
K=3.5e-06 cm/s
Eff. Porosity
Tot. Porosity
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150

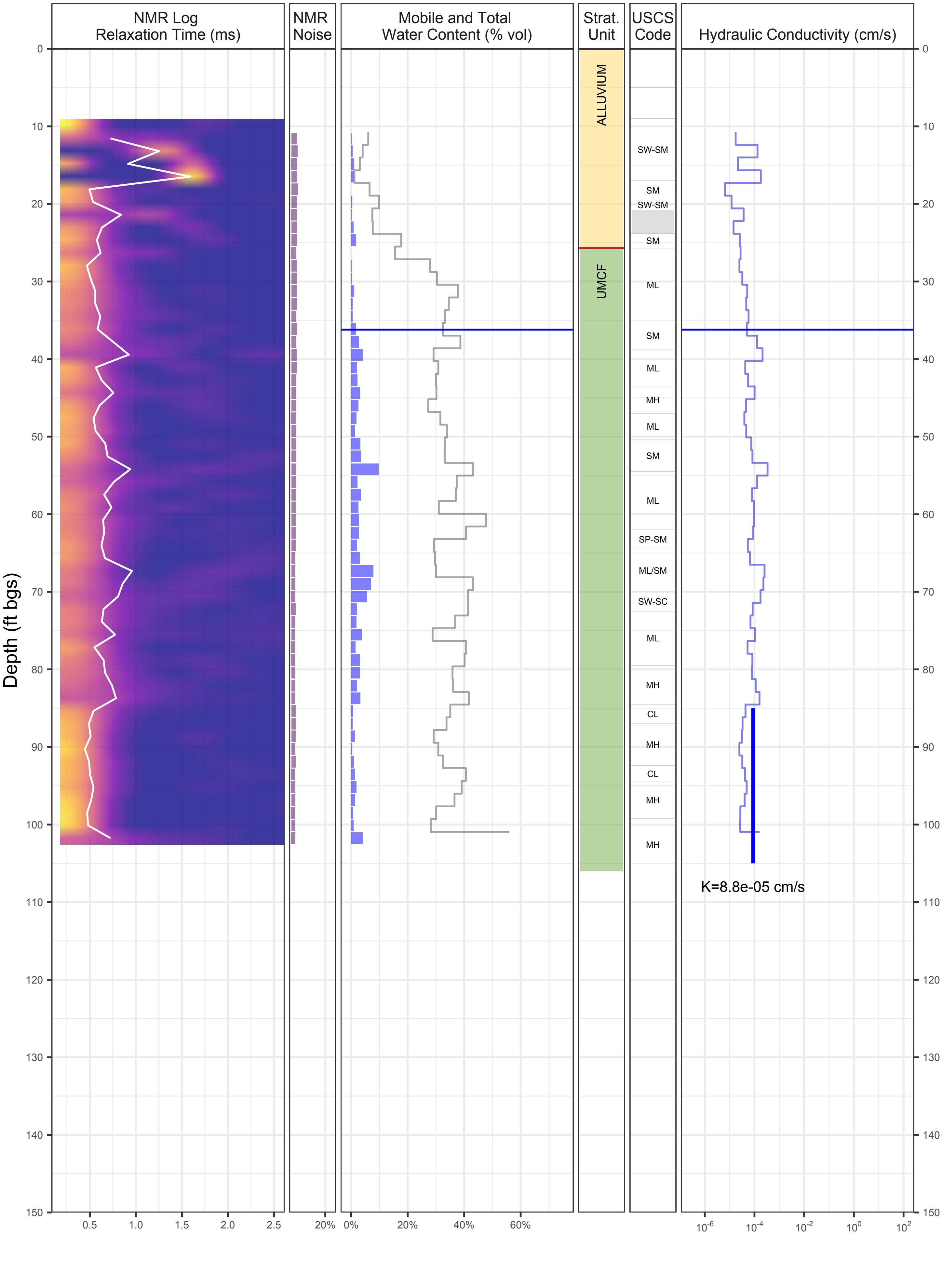

OU-1: M-231
NMR Log Relaxation Time (ms)
NMR Noise
Mobile and Total Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SW
SM
SC
SM
ML
ML
SM
ML/SM
ML
MH
ML
MH
MH
MH
CL
MH
CL
MH
ML
ML
ML
CL
ML
ML
CL
ML
ML/CL
ML
K=1.1e-06 cm/s
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150

OU-1: M-234

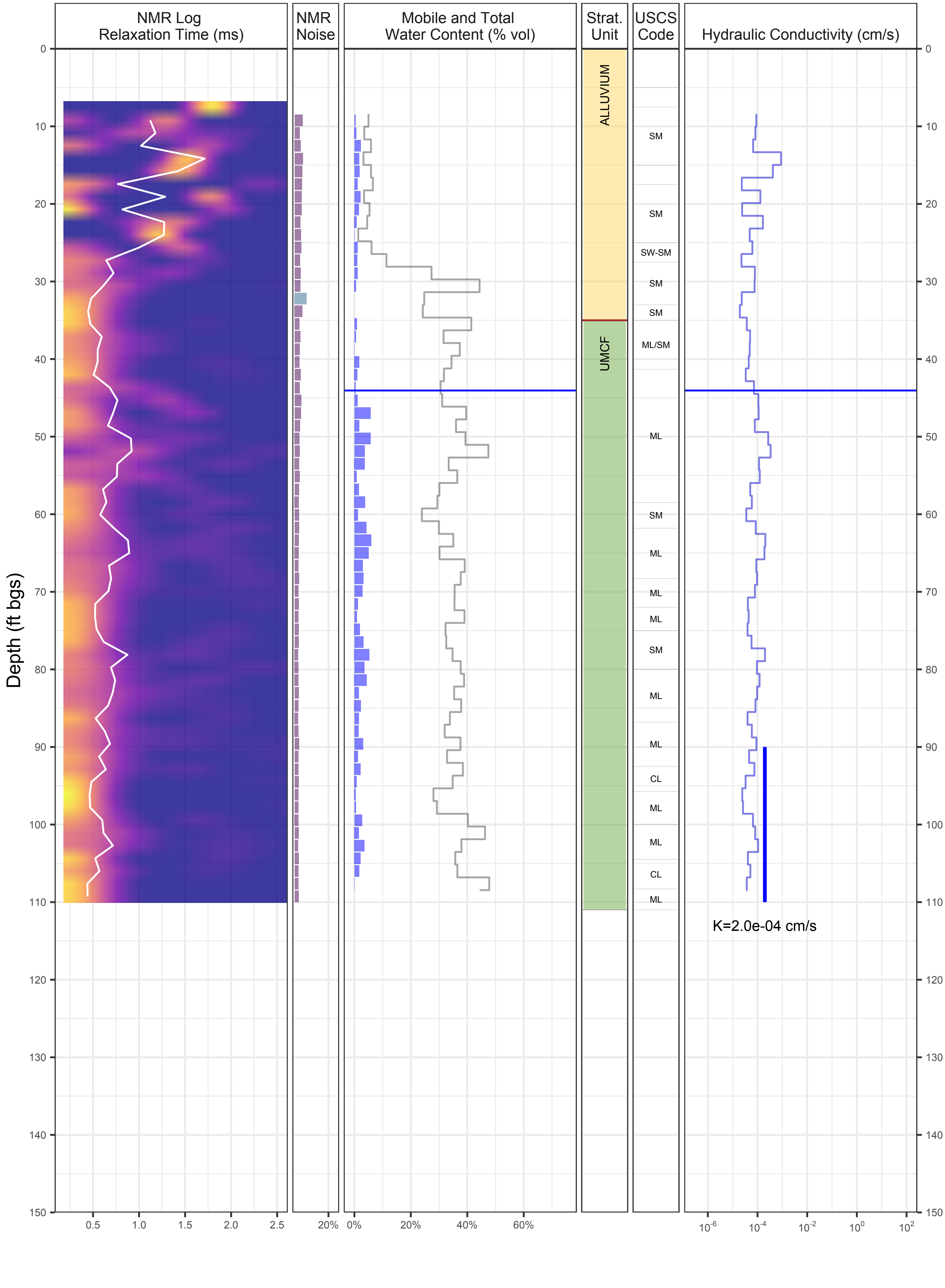

NMR Log
Relaxation Time (ms)
NMR
Noise
Mobile and Total
Water Content (% vol)
Strat.
Unit
USCS
Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SP-SM
SP
SM
SP-SM
ML
SP
ML
MH
ML
MH
SC
ML
MH
MH
ML
CL
MH
CH
ML
CL
K=4.2e-04 cm/s
Eff. Porosity
Tot. Porosity
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}


OU-1: M-235
NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SW-SM
SM
SM
ML
ML
SP-SC
ML
SM
ML
ML
SP-SM
ML
CL
ML
MH
CL
MH
MH
K=2.6e-05 cm/s
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}

OU-1: M-236

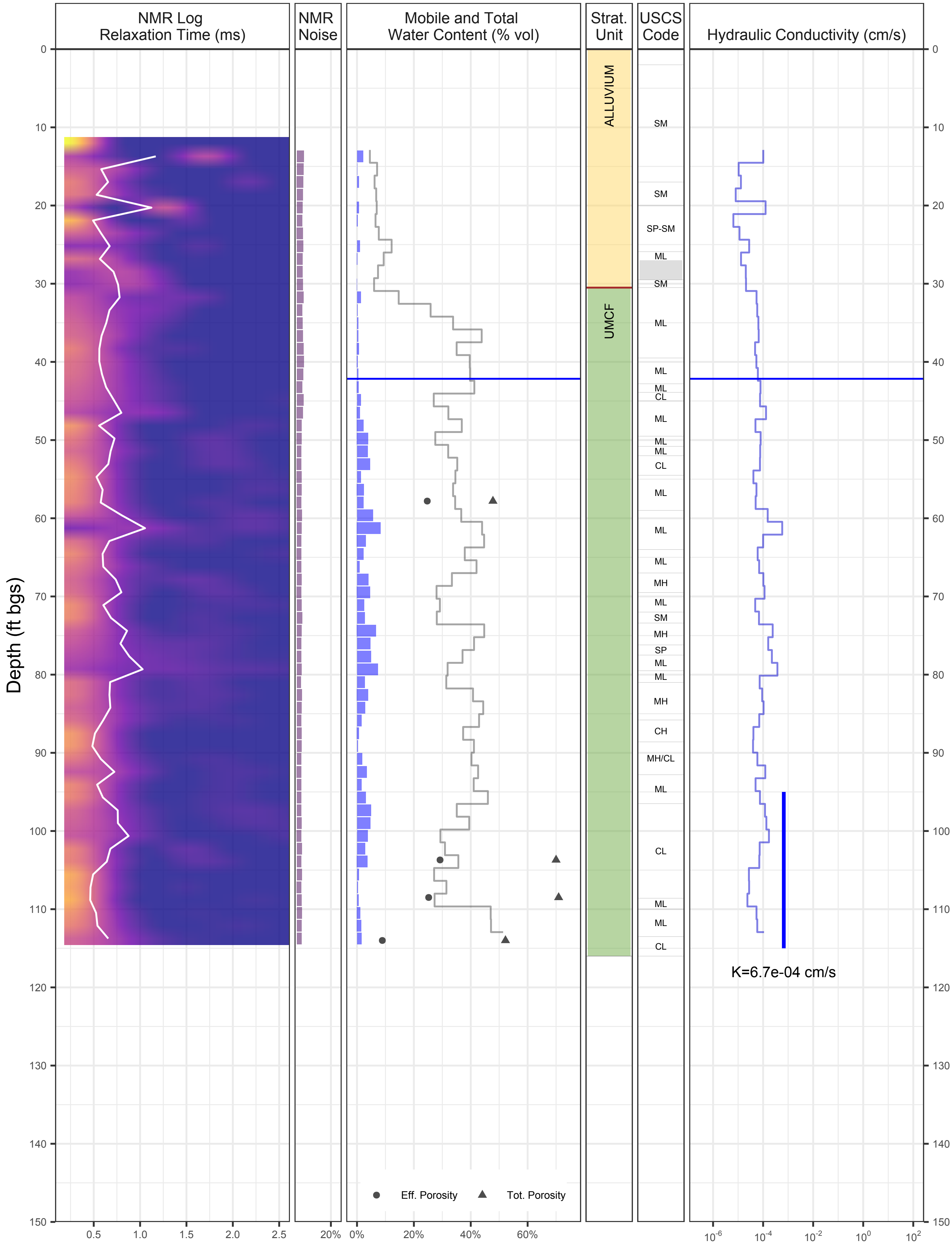

NMR Log
Relaxation Time (ms)
NMR
Noise
Mobile and Total
Water Content (% vol)
Strat.
Unit
USCS
Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SW-SM
SM
SW-SM
SM
ML
SM
ML
MH
ML
SM
ML
SP-SM
ML/SM
SW-SC
ML
MH
CL
MH
CL
MH
MH
K=8.8e-05 cm/s

OU-1: M-238



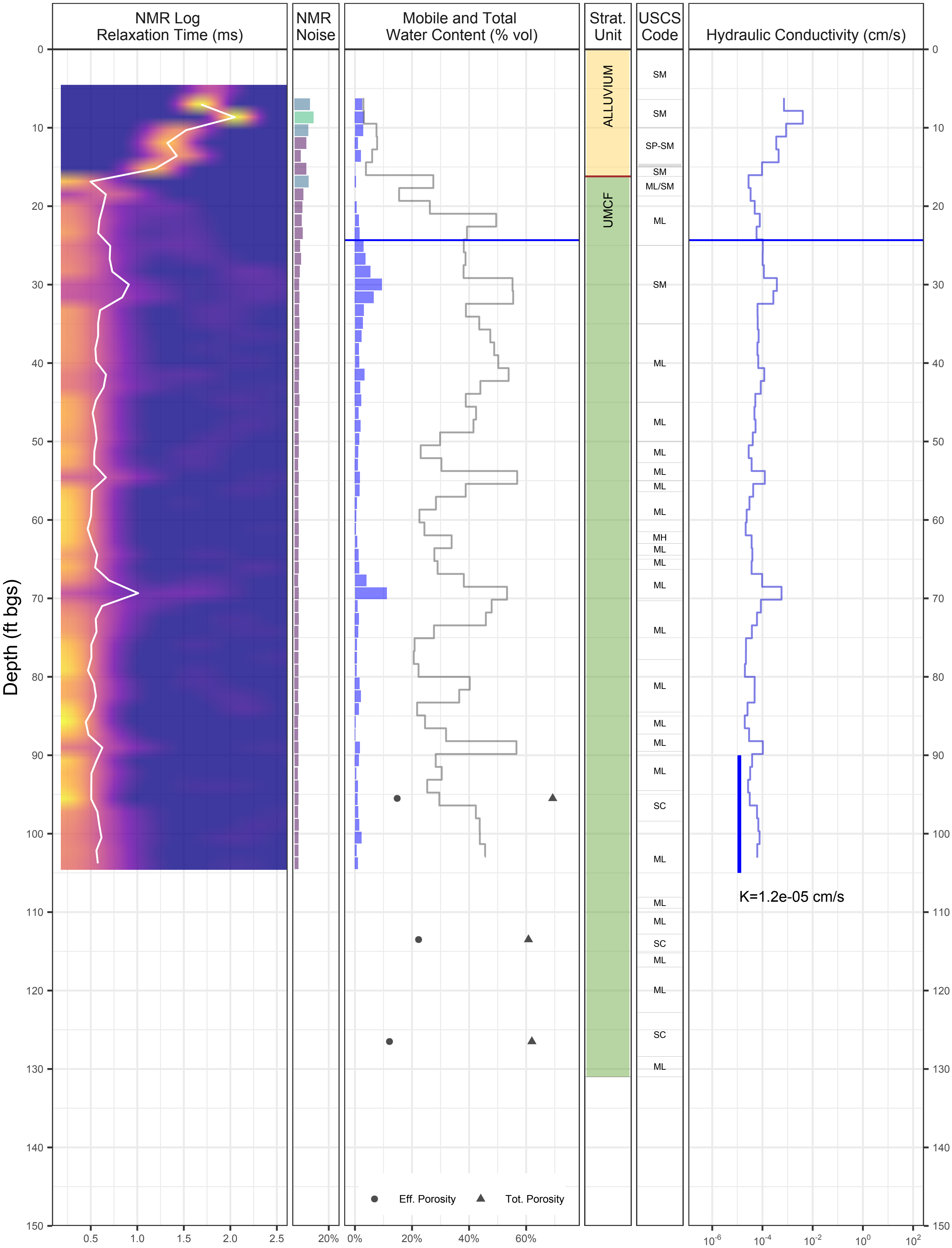
NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SM
SM
SW-SM
SM
SM
ML/SM
ML
SM
ML
ML
ML
SM
ML
ML
CL
ML
ML
CL
ML
K=2.0e-04 cm/s
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^-6
10^-4
10^-2
10^0
10^2

OU-1: M-240



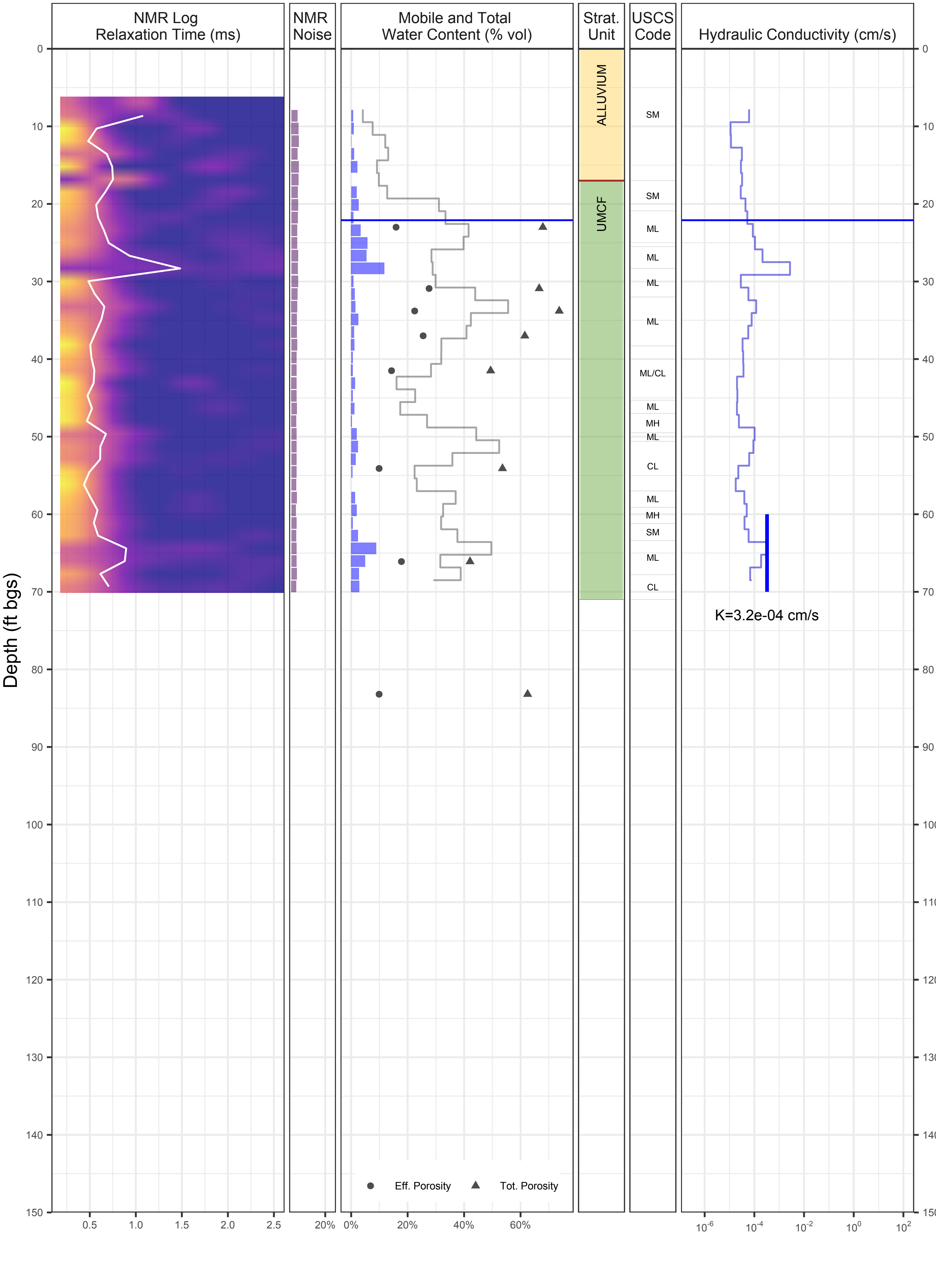
NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SM
SM
SP-SM
ML
SM
ML
ML
ML
CL
ML
ML
ML
CL
ML
ML
ML
MH
ML
SM
MH
SP
ML
ML
MH
CH
MH/CL
ML
CL
ML
ML
CL
K=6.7e-04 cm/s
Eff. Porosity
Tot. Porosity
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}

OU-1: M-244

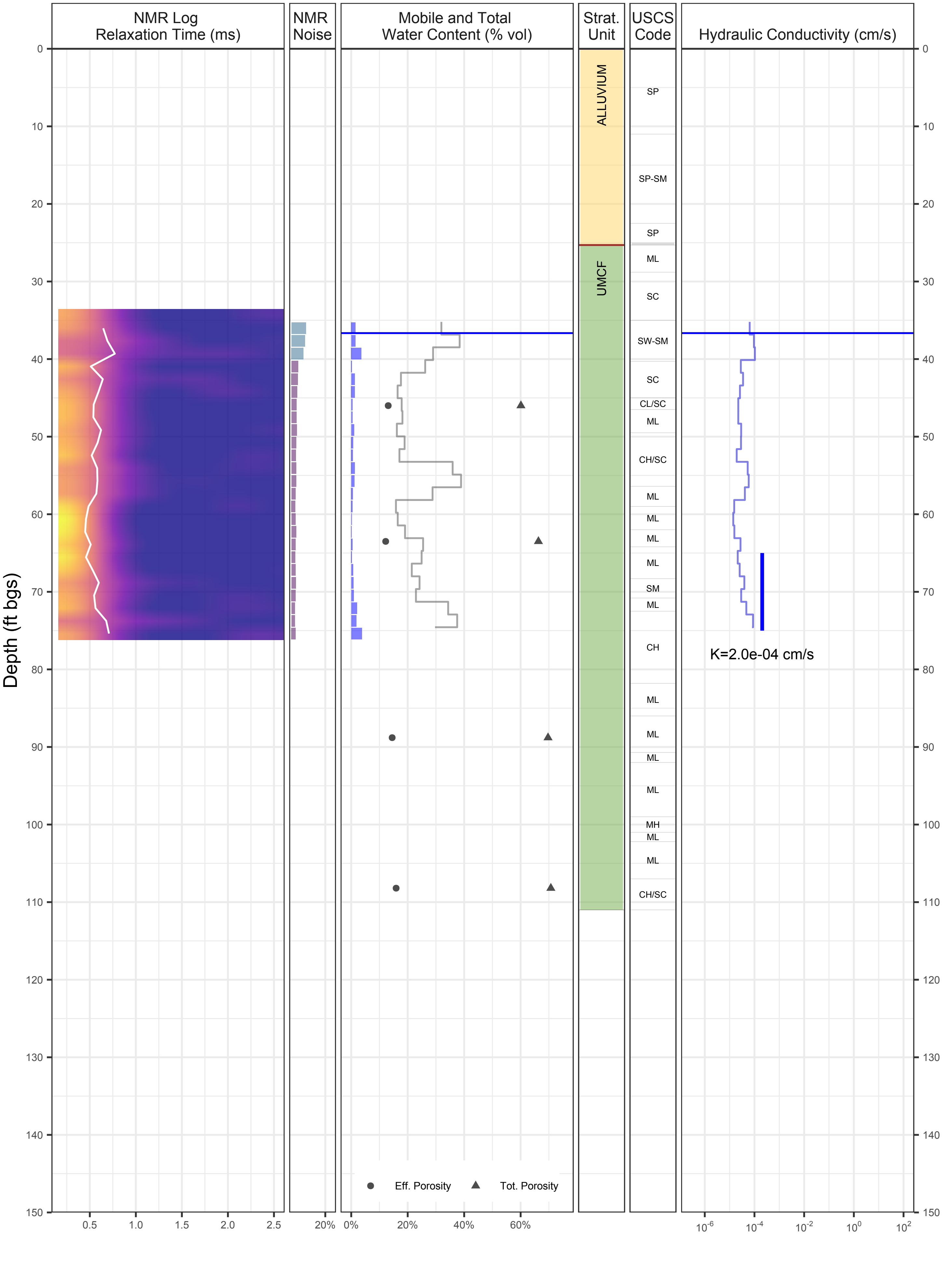


NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SM
SM
SP-SM
SM
ML/SM
ML
SM
ML
ML
ML
ML
ML
ML
MH
ML
ML
ML
ML
ML
ML
ML
ML
SC
ML
ML
ML
SC
ML
ML
SC
ML
K=1.2e-05 cm/s
Eff. Porosity
Tot. Porosity
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150

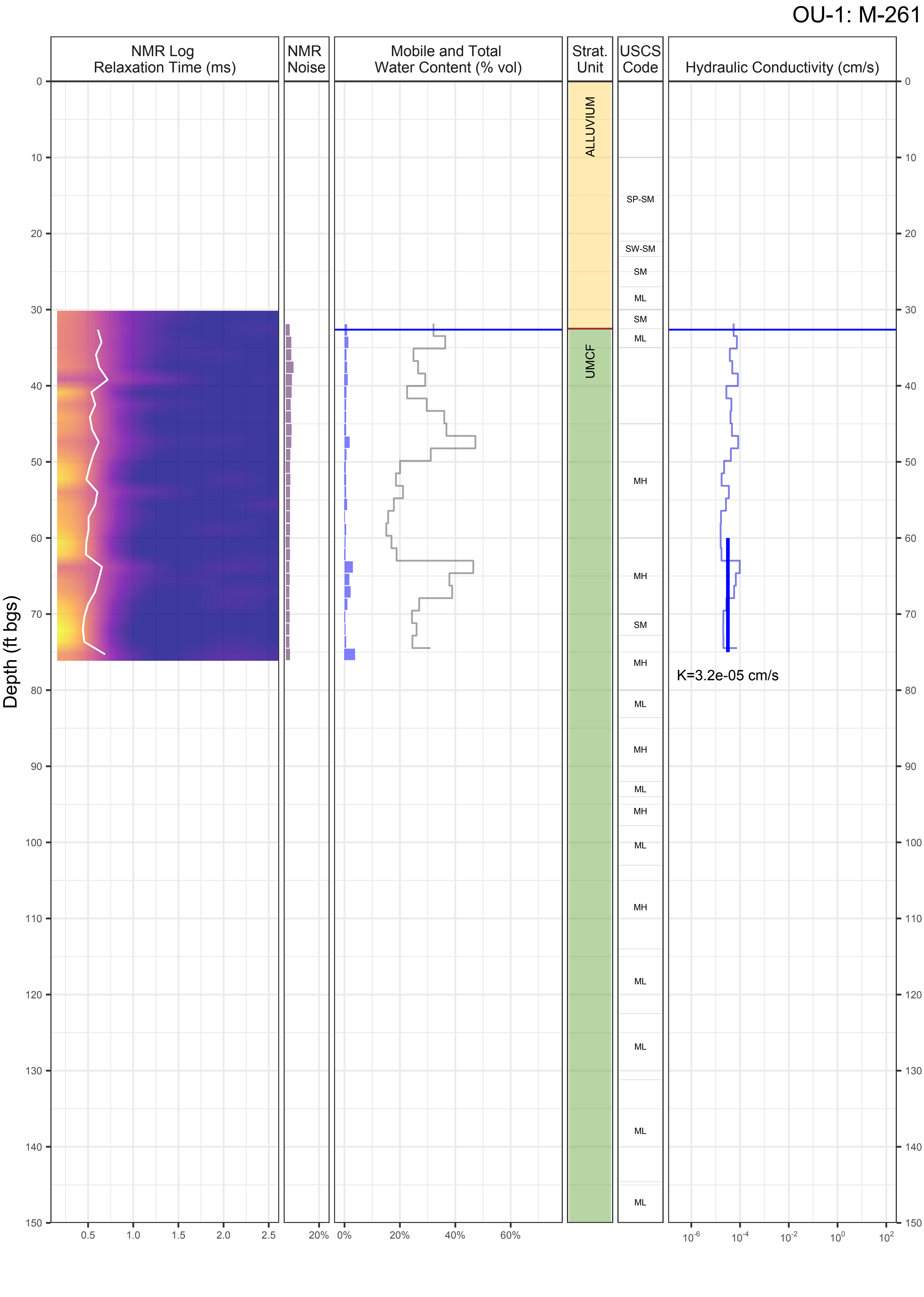
OU-1: M-246


NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SM
SM
ML
ML
ML
ML
ML/CL
ML
MH
ML
CL
ML
MH
SM
ML
CL
K=3.2e-04 cm/s
Eff. Porosity
Tot. Porosity
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150

OU-1: M-260

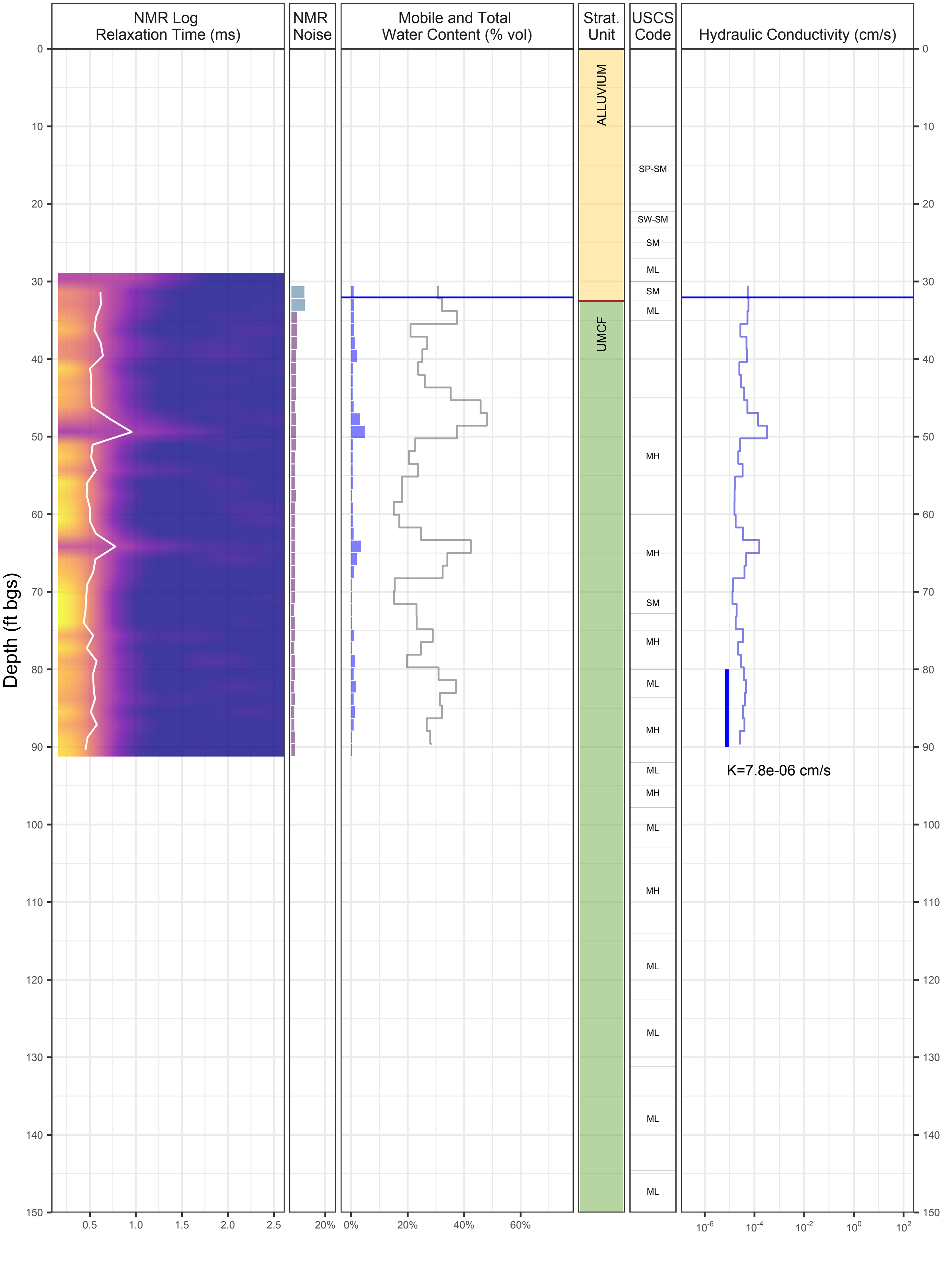


NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SP
SP-SM
SP
ML
SC
SW-SM
SC
CL/SC
ML
CH/SC
ML
ML
ML
ML
SM
ML
CH
ML
ML
ML
ML
MH
ML
ML
CH/SC
K=2.0e-04 cm/s
Eff. Porosity
Tot. Porosity
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150



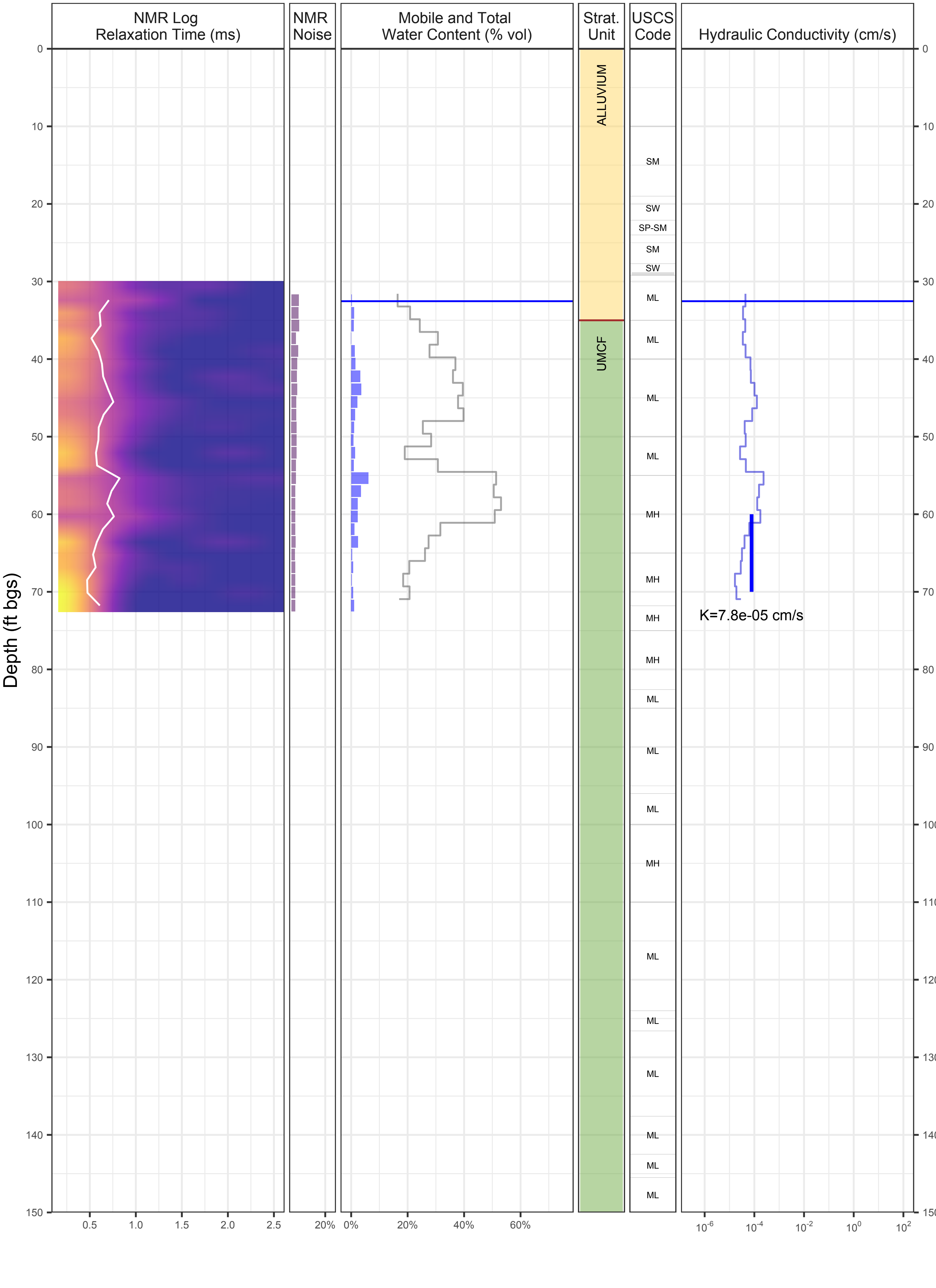
OU-1: M-261
NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SP-SM
SW-SM
SM
ML
SM
ML
MH
MH
SM
MH
ML
MH
ML
MH
ML
MH
ML
ML
ML
ML
K=3.2e-05 cm/s
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150

OU-1: M-262



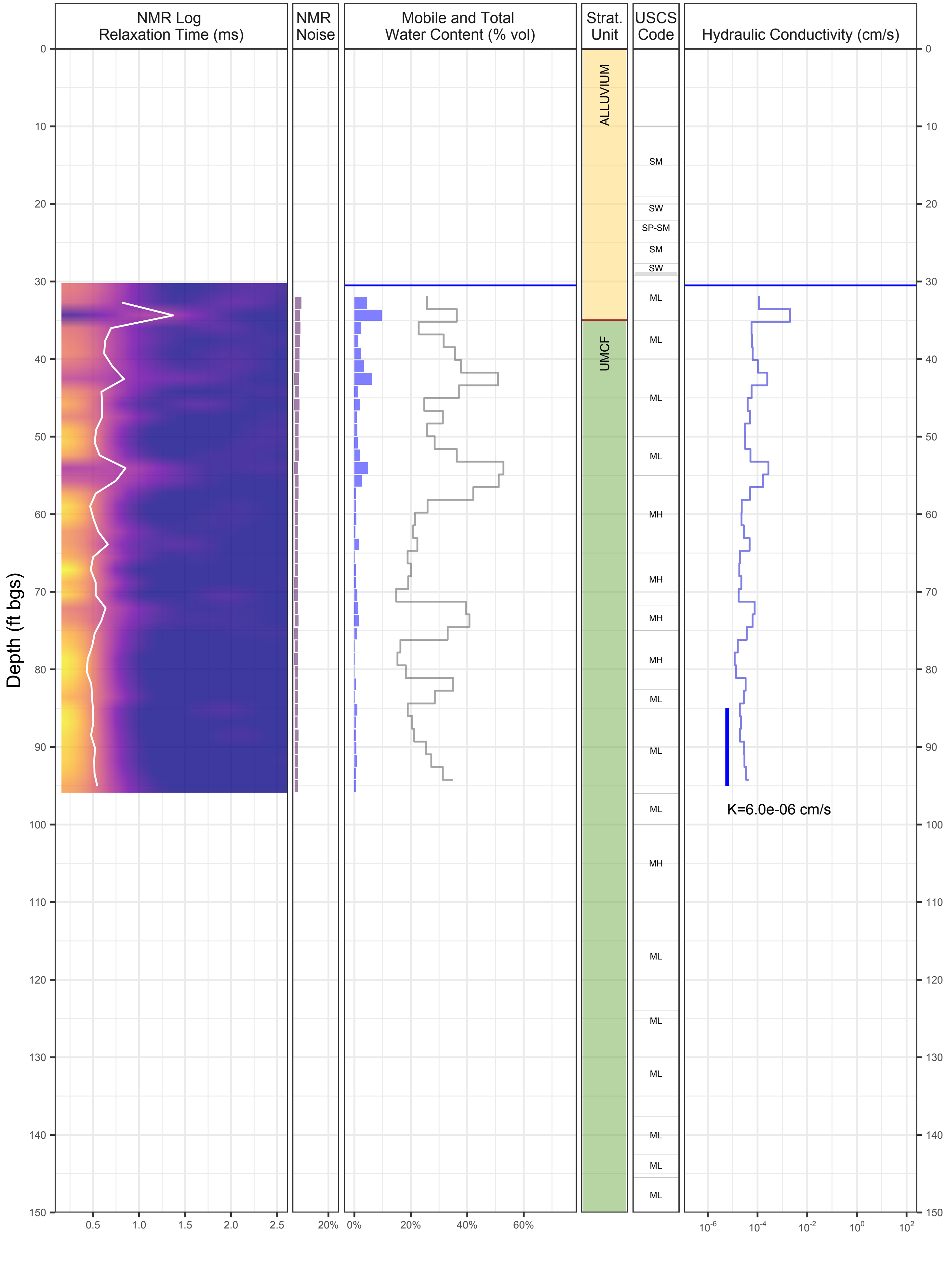
NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SP-SM
SW-SM
SM
ML
SM
ML
MH
MH
SM
MH
ML
MH
ML
MH
ML
MH
ML
ML
ML
ML
K=7.8e-06 cm/s
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}

OU-1: M-263



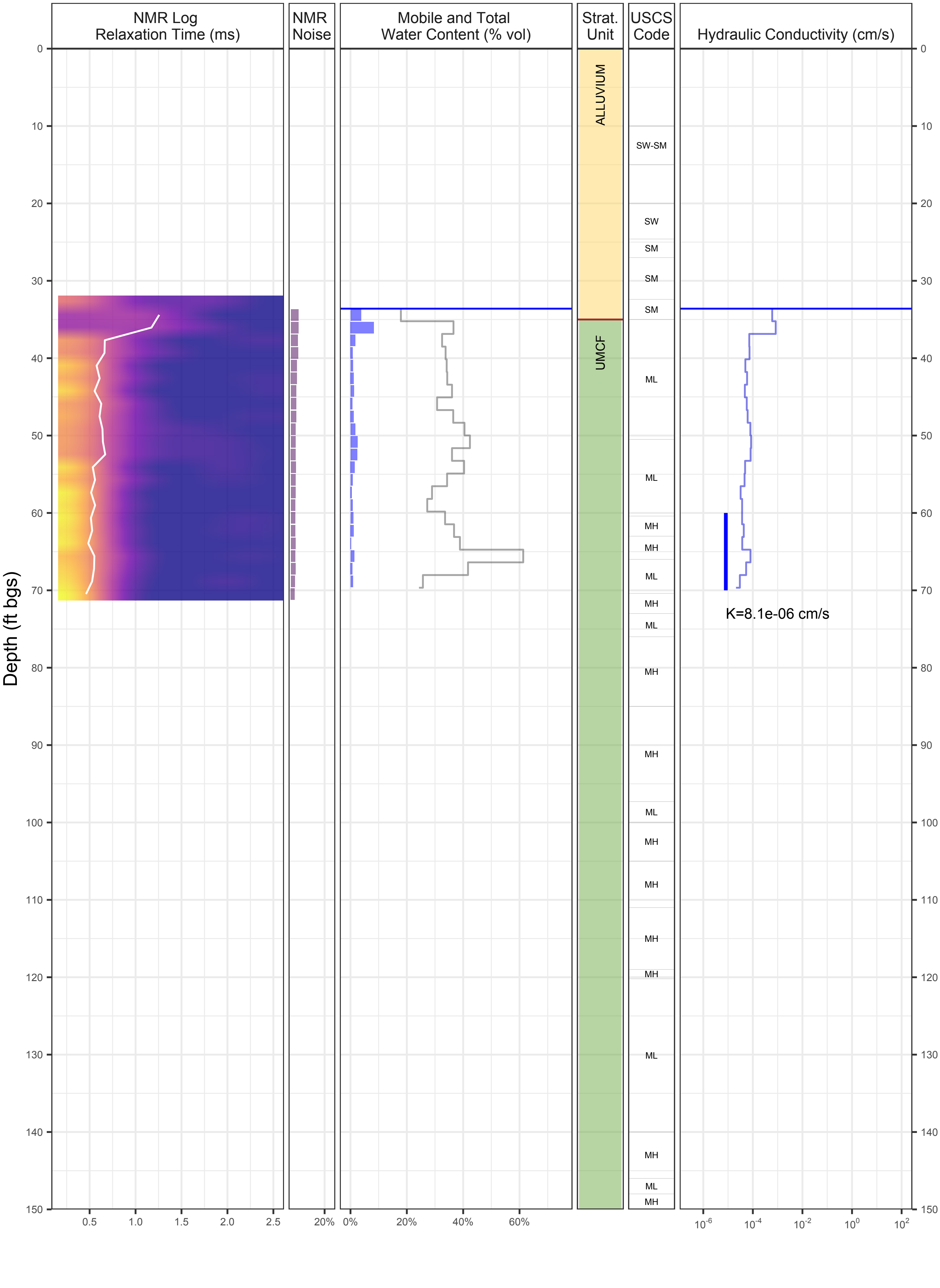
NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SM
SW
SP-SM
SM
SW
ML
ML
ML
ML
MH
MH
MH
MH
ML
ML
ML
MH
ML
ML
ML
ML
ML
ML
K=7.8e-05 cm/s
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}

OU-1: M-264

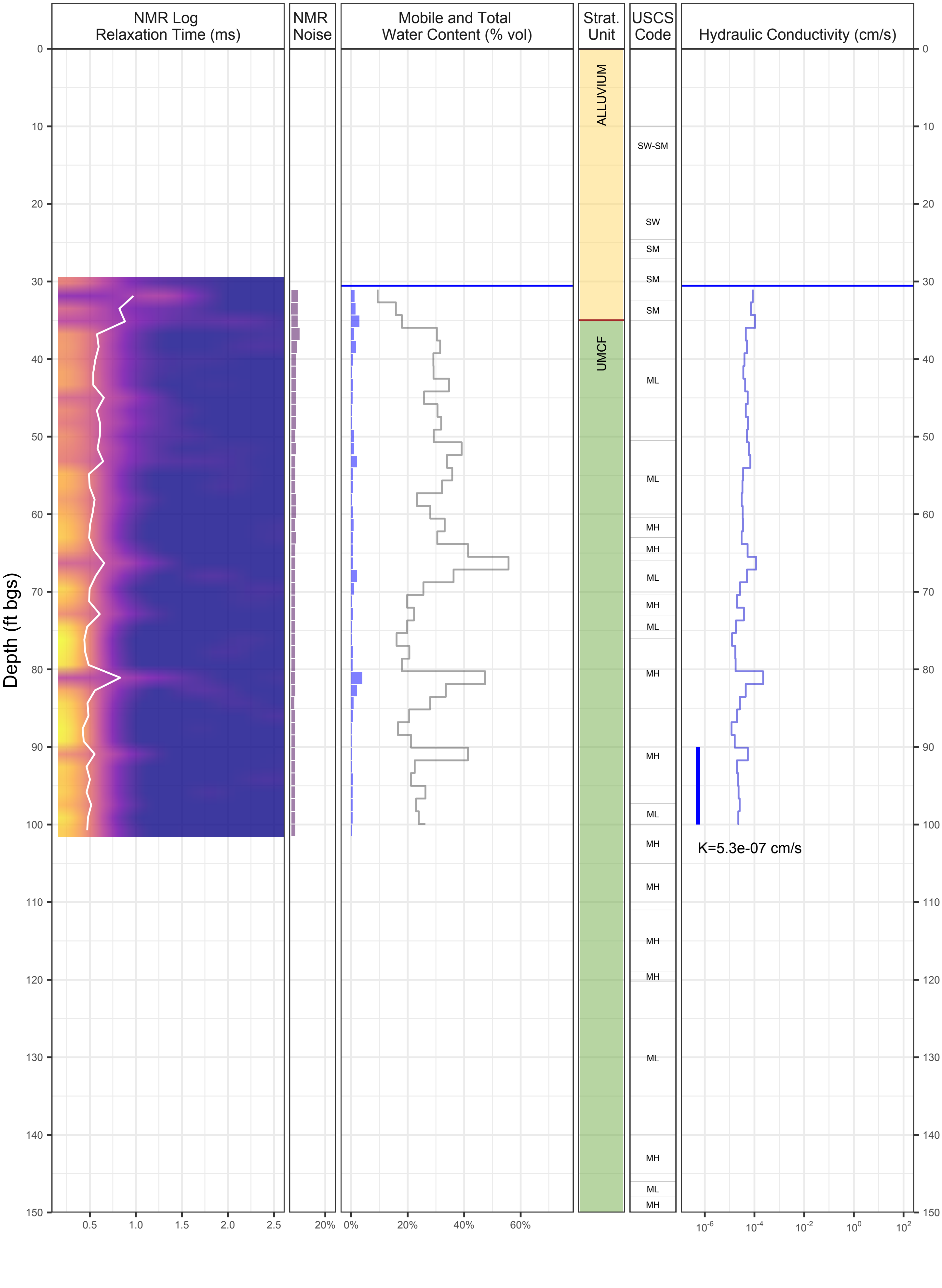


NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SM
SW
SP-SM
SM
SW
ML
ML
ML
ML
MH
MH
MH
MH
ML
ML
ML
MH
ML
ML
ML
ML
ML
ML
K=6.0e-06 cm/s
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}

OU-1: M-265

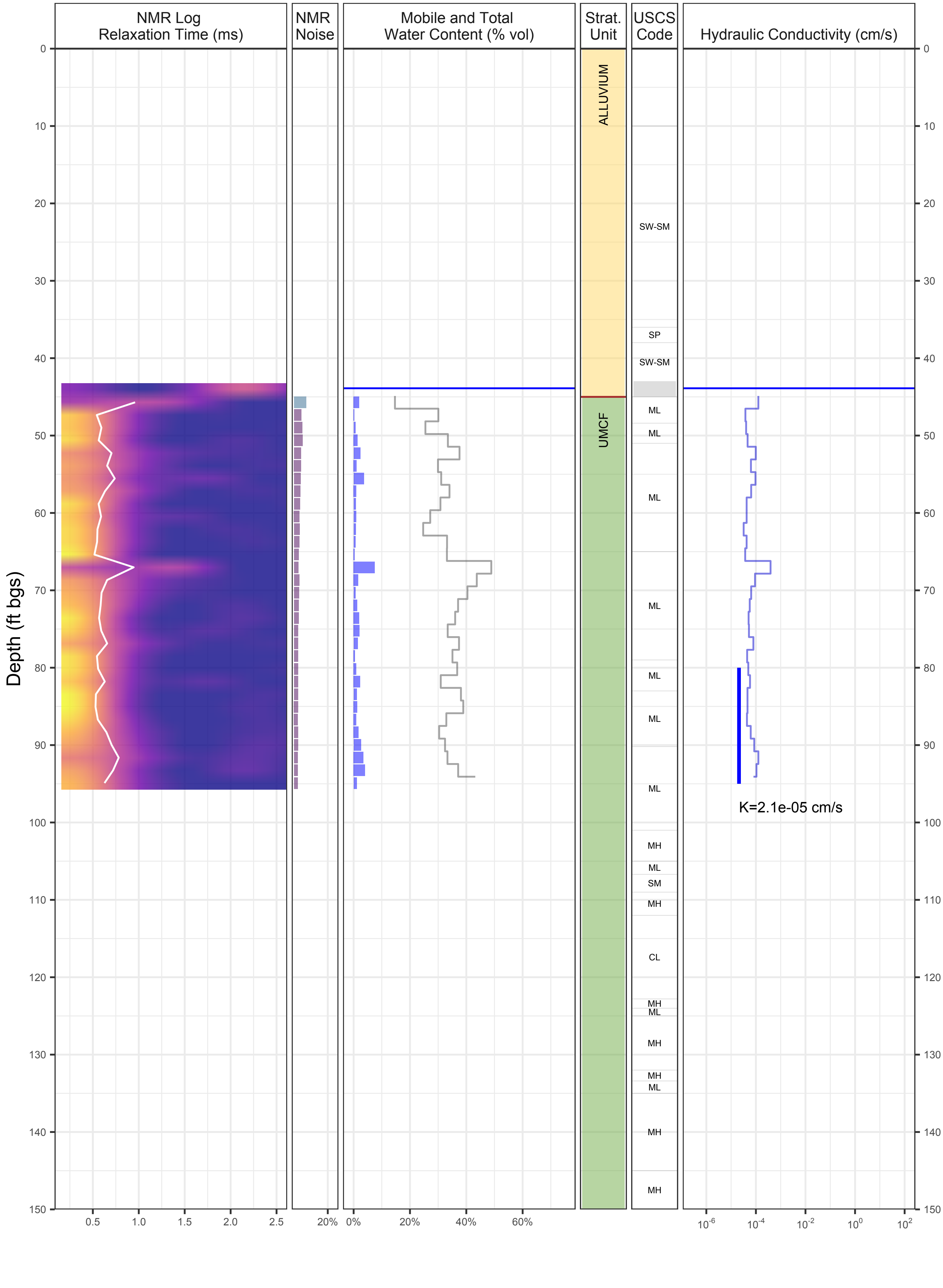

NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SW-SM
SW
SM
SM
SM
ML
ML
MH
MH
ML
MH
ML
MH
MH
ML
MH
MH
MH
MH
ML
MH
ML
MH
K=8.1e-06 cm/s

OU-1: M-266



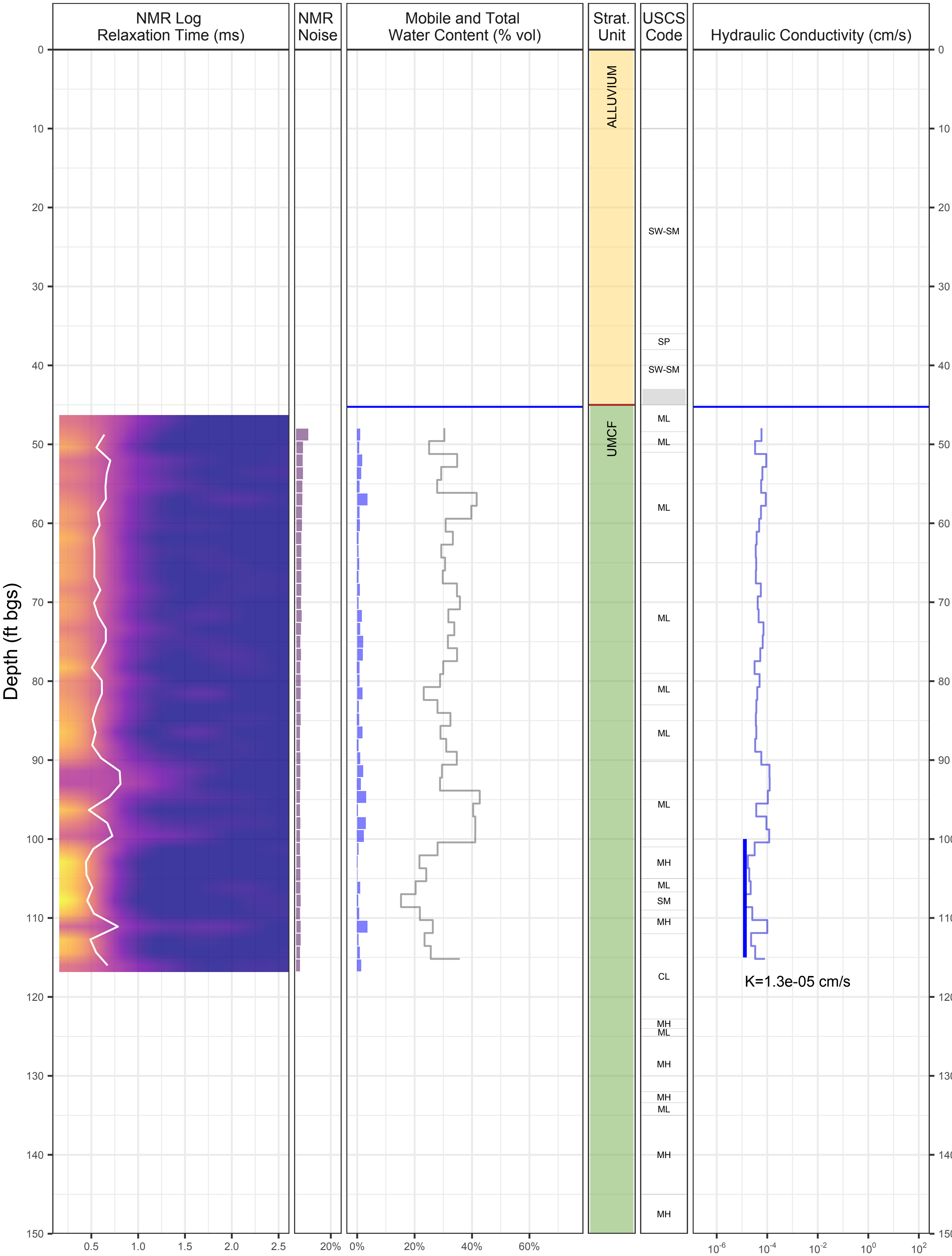
NMR Log
Relaxation Time (ms)
NMR
Noise
Mobile and Total
Water Content (% vol)
Strat.
Unit
USCS
Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SW-SM
SW
SM
SM
SM
ML
ML
MH
MH
ML
MH
ML
MH
MH
ML
MH
MH
MH
MH
ML
MH
ML
MH
K=5.3e-07 cm/s
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}

OU-1: M-267

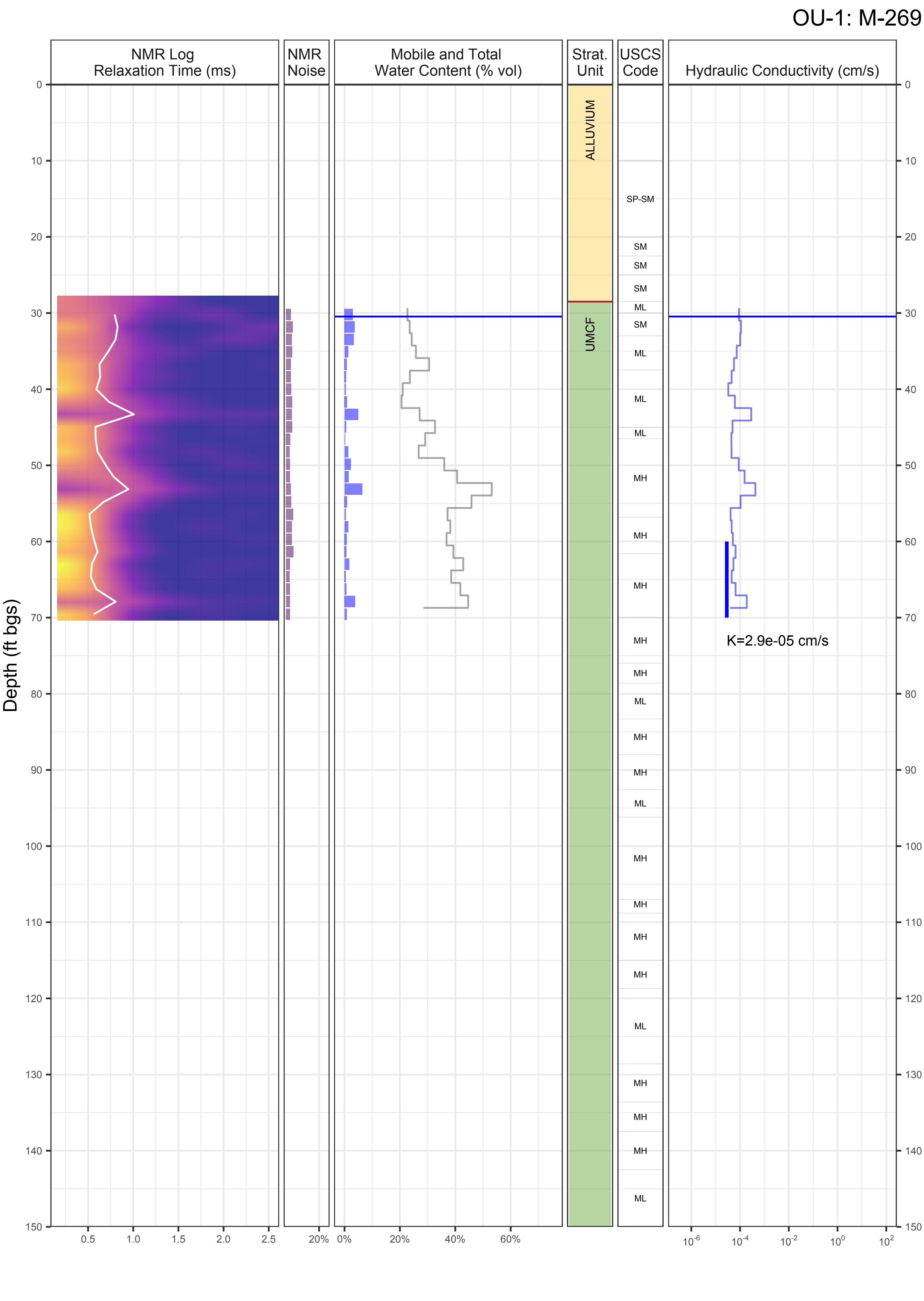


NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SW-SM
SP
SW-SM
ML
ML
ML
ML
ML
ML
ML
MH
ML
SM
MH
CL
MH
ML
MH
MH
ML
MH
MH
K=2.1e-05 cm/s
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150

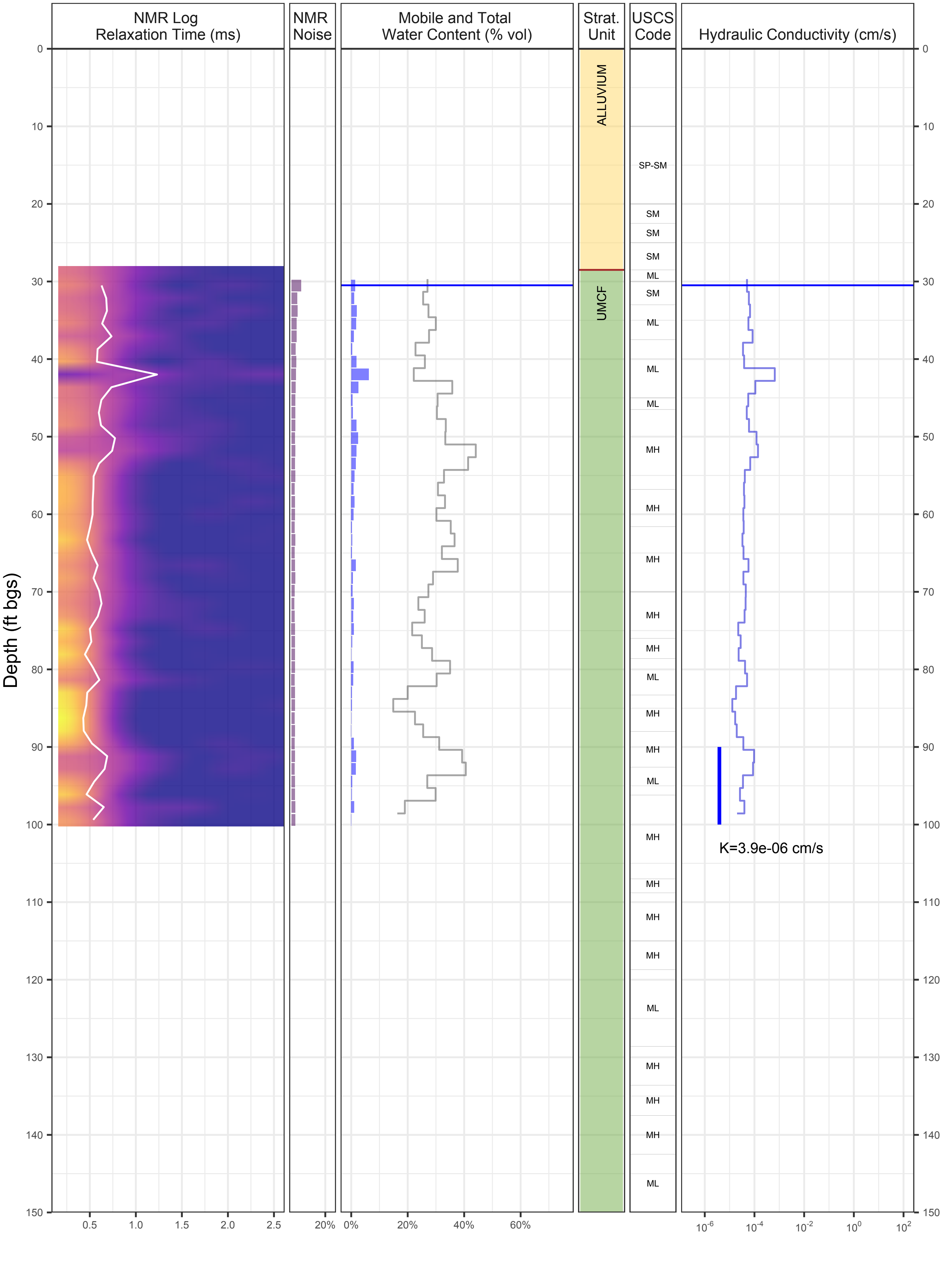
OU-1: M-268



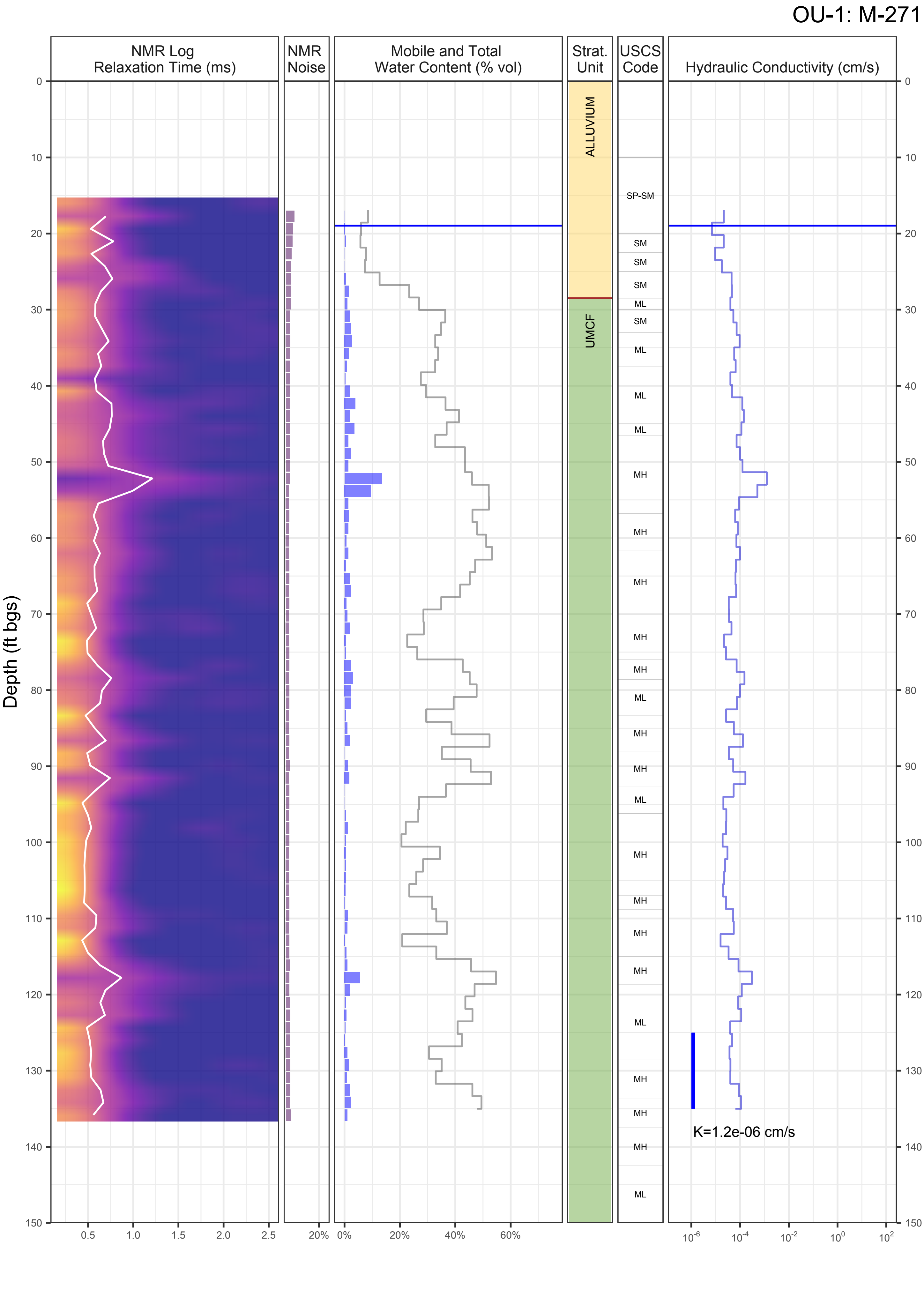
NMR Log Relaxation Time (ms)
NMR Noise
Mobile and Total Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SW-SM
SP
SW-SM
ML
ML
ML
ML
ML
ML
ML
MH
ML
SM
MH
CL
MH
ML
MH
MH
ML
MH
MH
K=1.3e-05 cm/s
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150


OU-1: M-269
NMR Log
Relaxation Time (ms)
NMR
Noise
Mobile and Total
Water Content (% vol)
Strat.
Unit
USCS
Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SP-SM
SM
SM
SM
ML
SM
ML
ML
ML
MH
MH
MH
MH
MH
ML
MH
MH
ML
MH
MH
MH
MH
ML
MH
MH
MH
ML
K=2.9e-05 cm/s
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}

OU-1: M-270

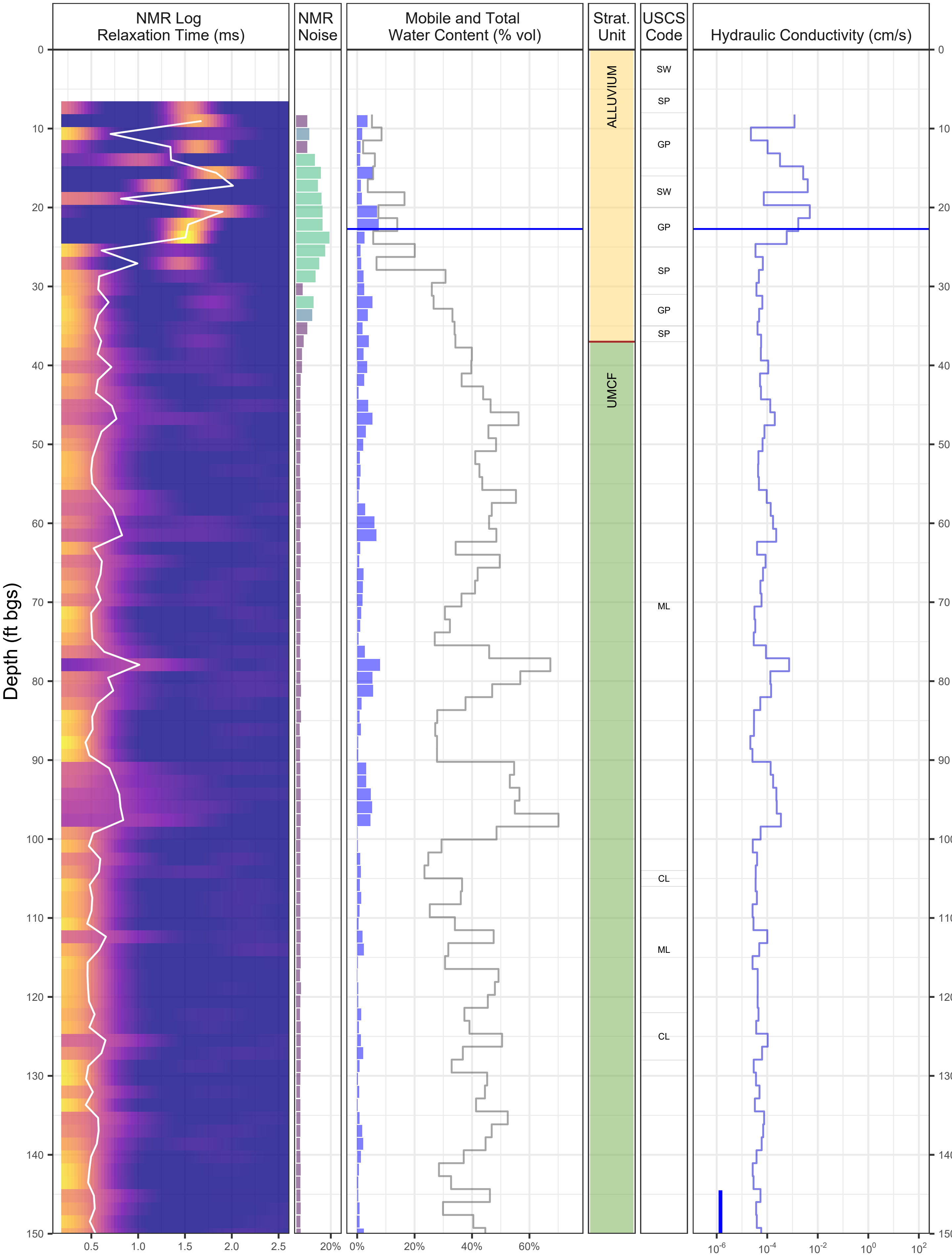


NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SP-SM
SM
SM
SM
ML
SM
ML
ML
ML
MH
MH
MH
MH
MH
ML
MH
MH
ML
MH
MH
MH
MH
ML
MH
MH
MH
ML
K=3.9e-06 cm/s

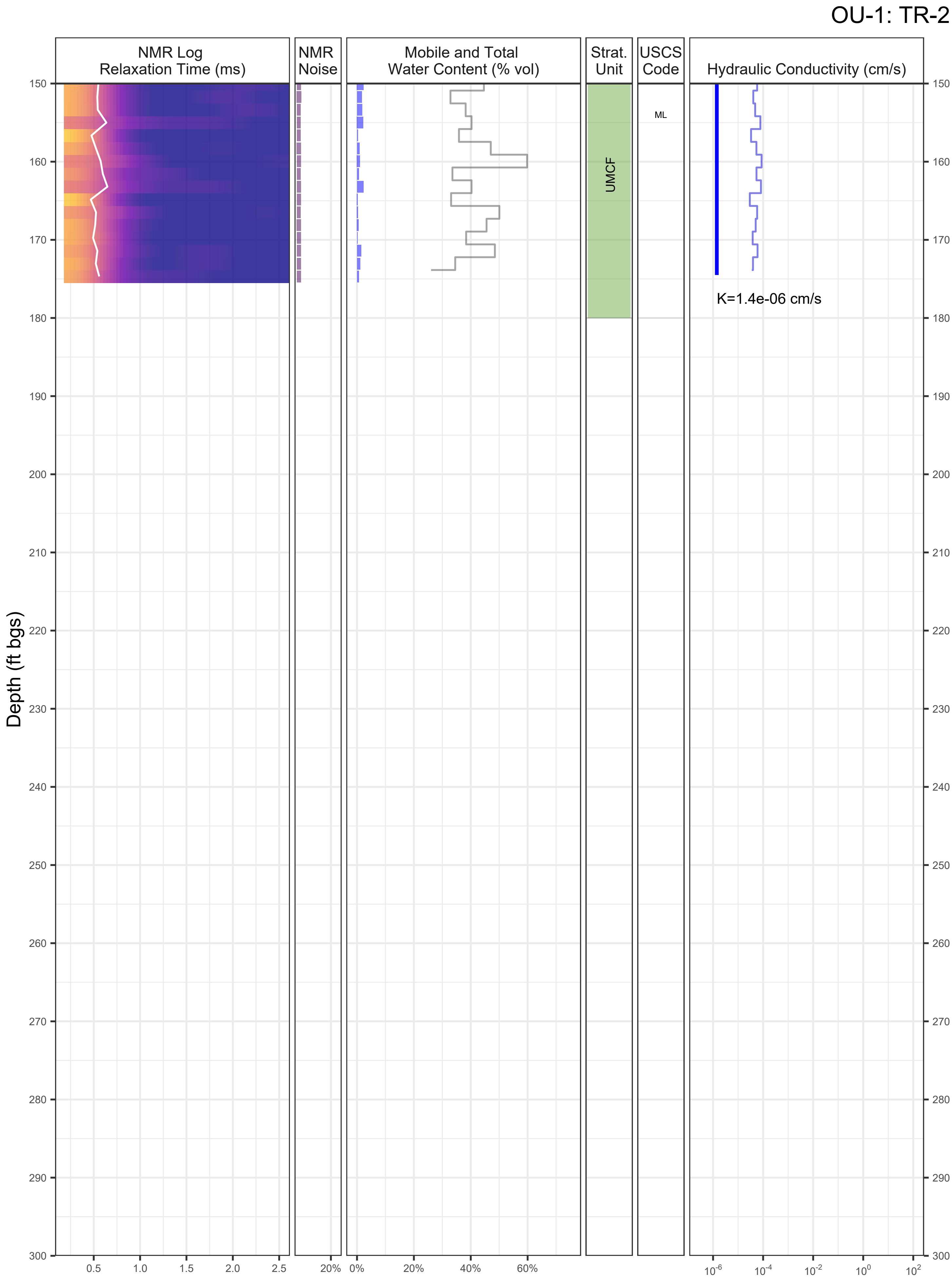


OU-1: M-271
NMR Log Relaxation Time (ms)
NMR Noise
Mobile and Total Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SP-SM
SM
SM
SM
ML
SM
ML
ML
ML
MH
MH
MH
MH
MH
ML
MH
MH
ML
MH
MH
MH
MH
ML
MH
MH
MH
ML
K=1.2e-06 cm/s

OU-1: TR-2

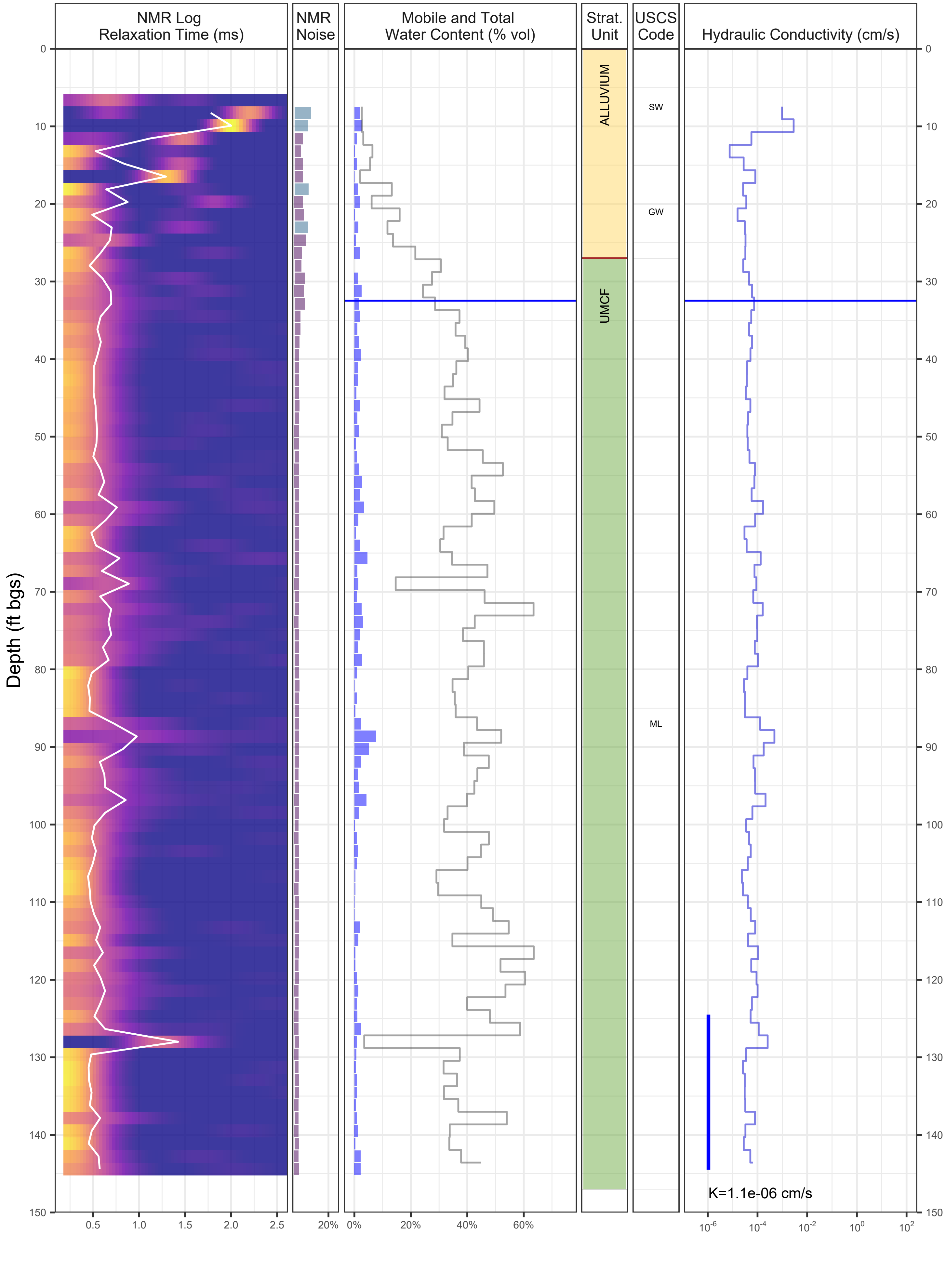


NMR Log
Relaxation Time (ms)
NMR
Noise
Mobile and Total
Water Content (% vol)
Strat.
Unit
USCS
Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SW
SP
GP
SW
GP
SP
GP
SP
ML
CL
ML
CL
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}



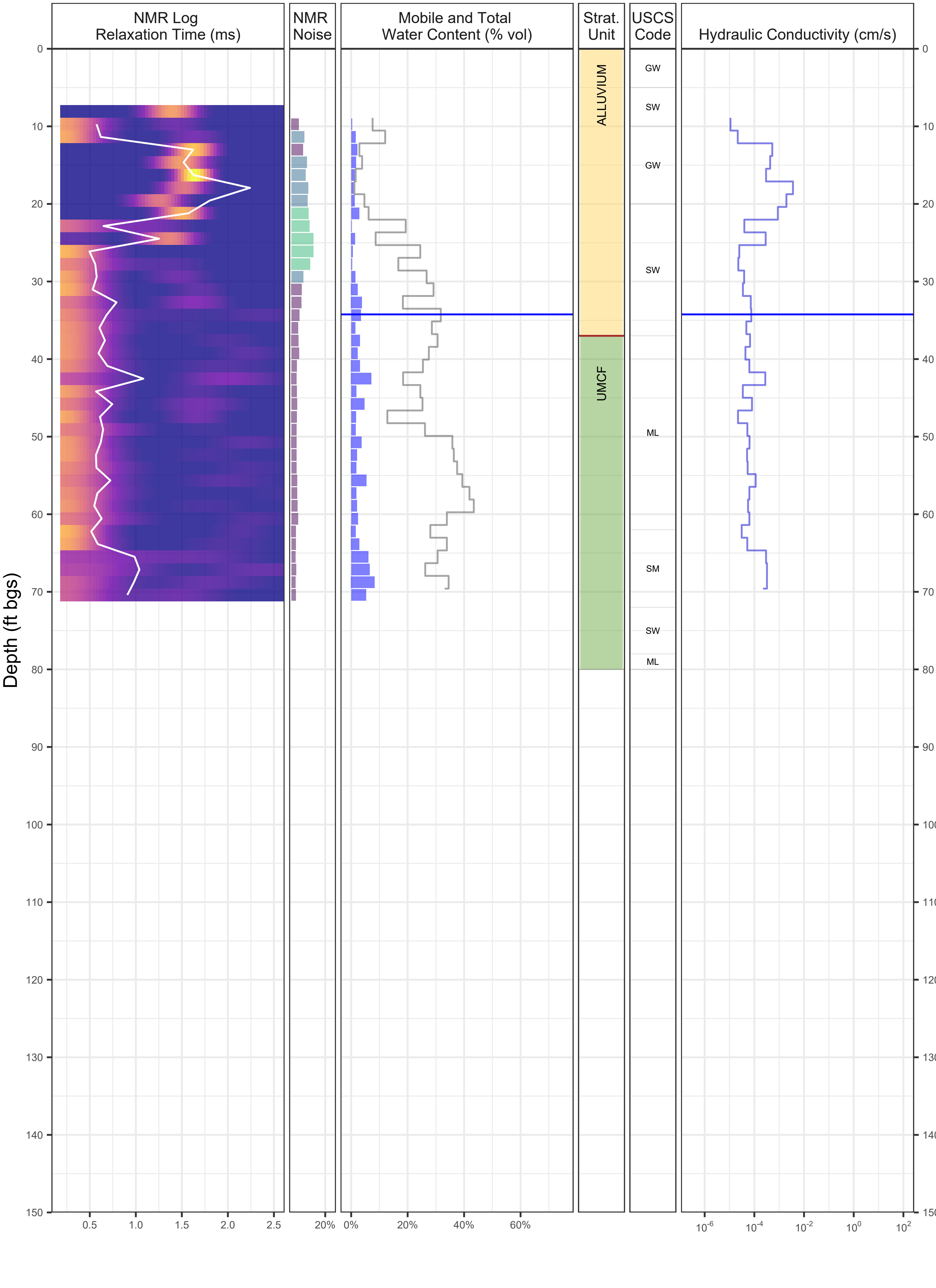
OU-1: TR-2
NMR Log
Relaxation Time (ms)
NMR
Noise
Mobile and Total
Water Content (% vol)
Strat.
Unit
USCS
Code
Hydraulic Conductivity (cm/s)
UMCF
ML
K=1.4e-06 cm/s
Depth (ft bgs)
150
160
170
180
190
200
210
220
230
240
250
260
270
280
290
300
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^-6
10^-4
10^-2
10^0
10^2

OU-1: TR-4

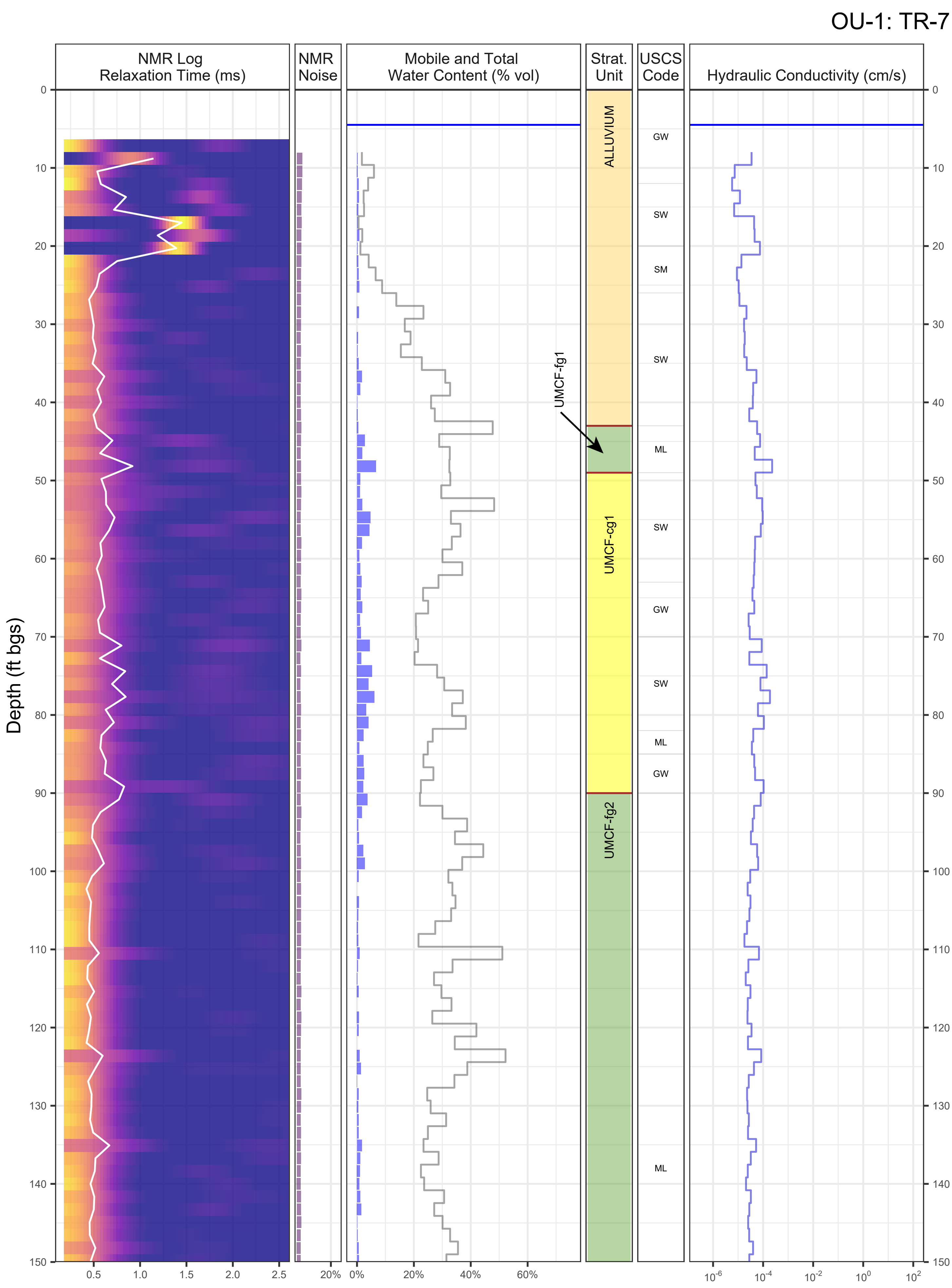


NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SW
GW
ML
K=1.1e-06 cm/s

OU-1: TR-6

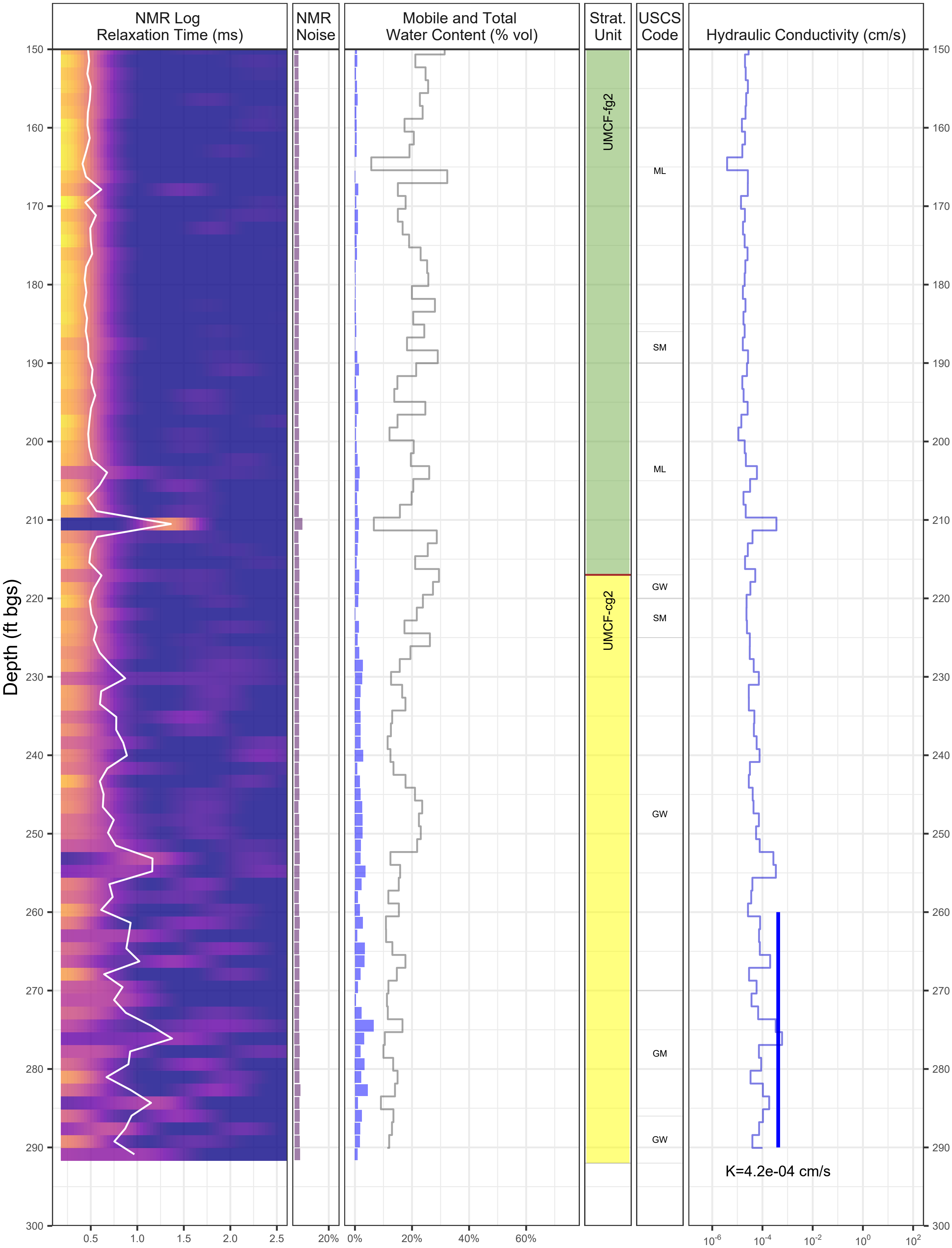


NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
GW
SW
GW
SW
ML
SM
SW
ML
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}



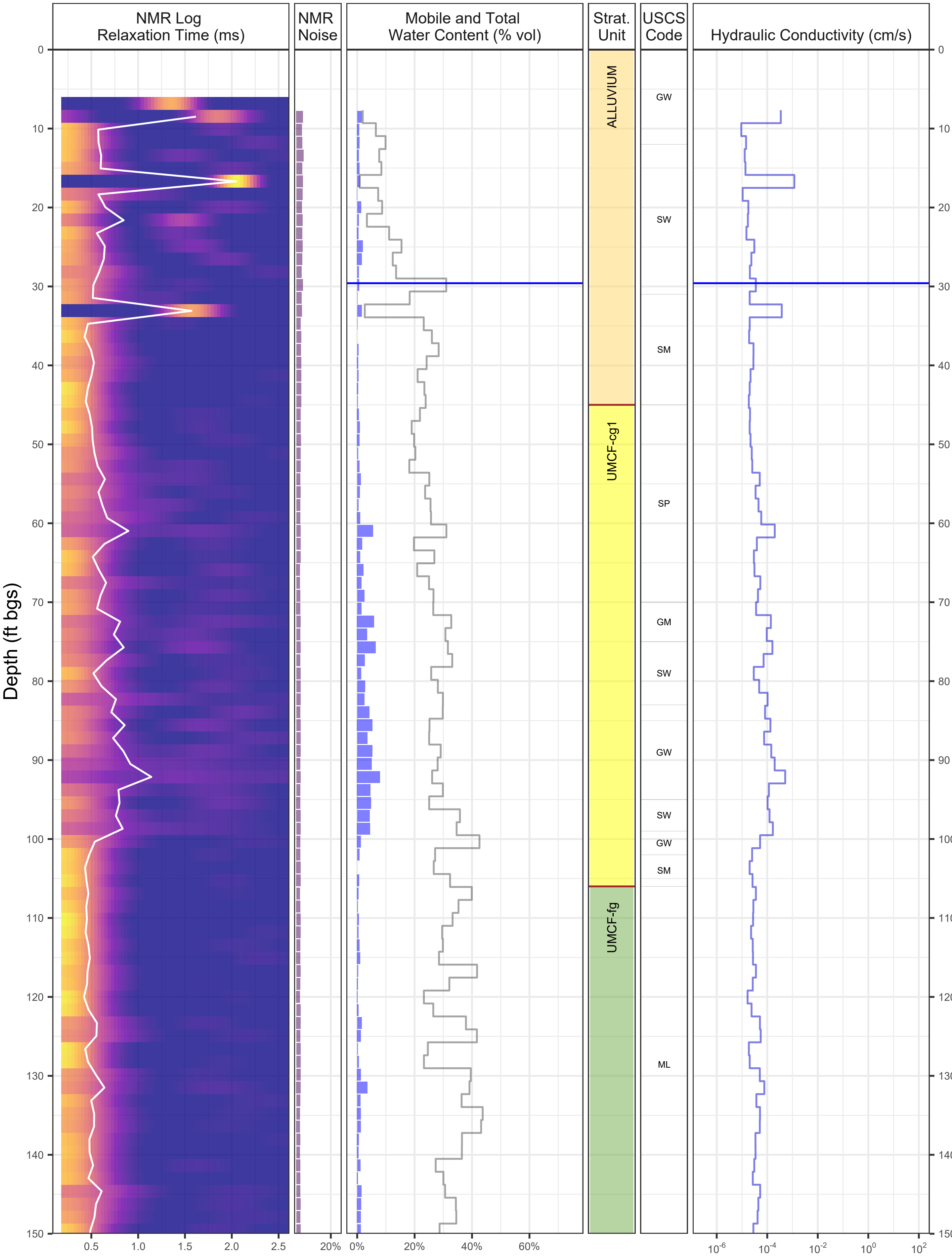
OU-1: TR-7
NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF-fg1
UMCF-cg1
UMCF-fg2
GW
SW
SM
SW
ML
SW
GW
SW
ML
GW
ML

OU-1: TR-7



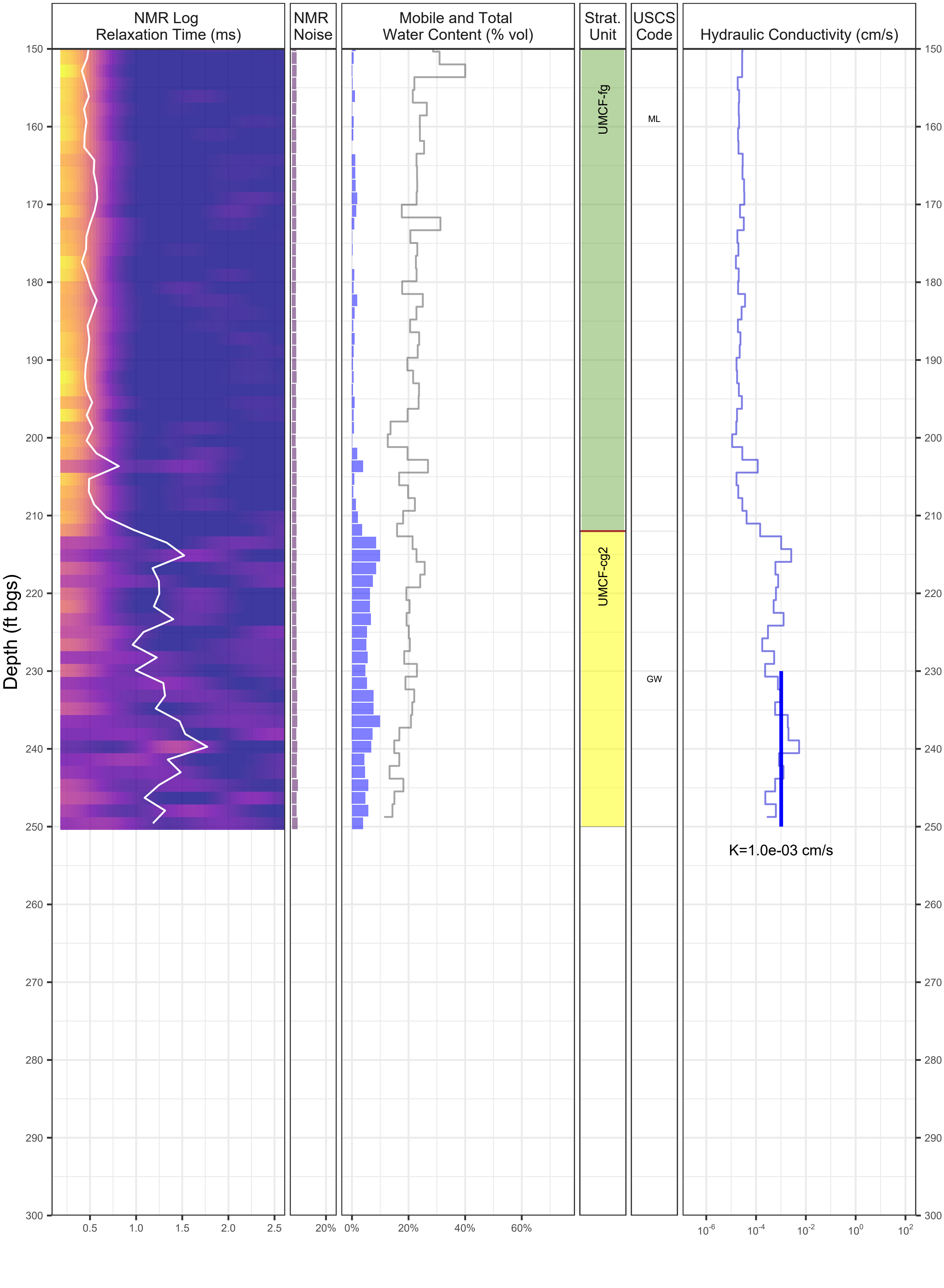
NMR Log
Relaxation Time (ms)
NMR
Noise
Mobile and Total
Water Content (% vol)
Strat.
Unit
USCS
Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
150
160
170
180
190
200
210
220
230
240
250
260
270
280
290
300
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
UMCF-fg2
UMCF-cg2
ML
SM
ML
GW
SM
GW
GM
GW
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}
K=4.2e-04 cm/s

OU-1: TR-9

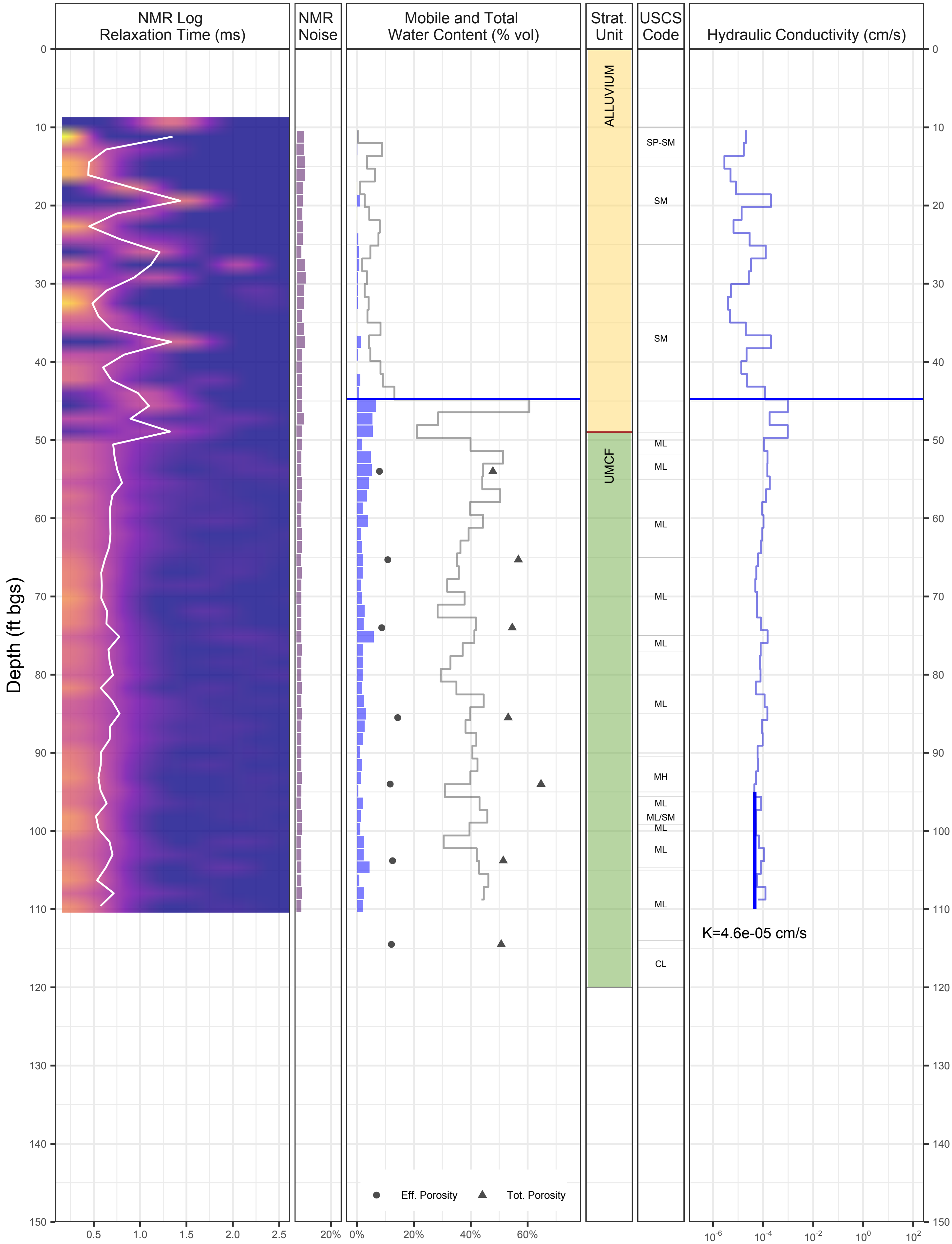


NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
ALLUVIUM
UMCF-cg1
UMCF-fg
GW
SW
SM
SP
GM
SW
GW
SW
GW
SM
ML
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}

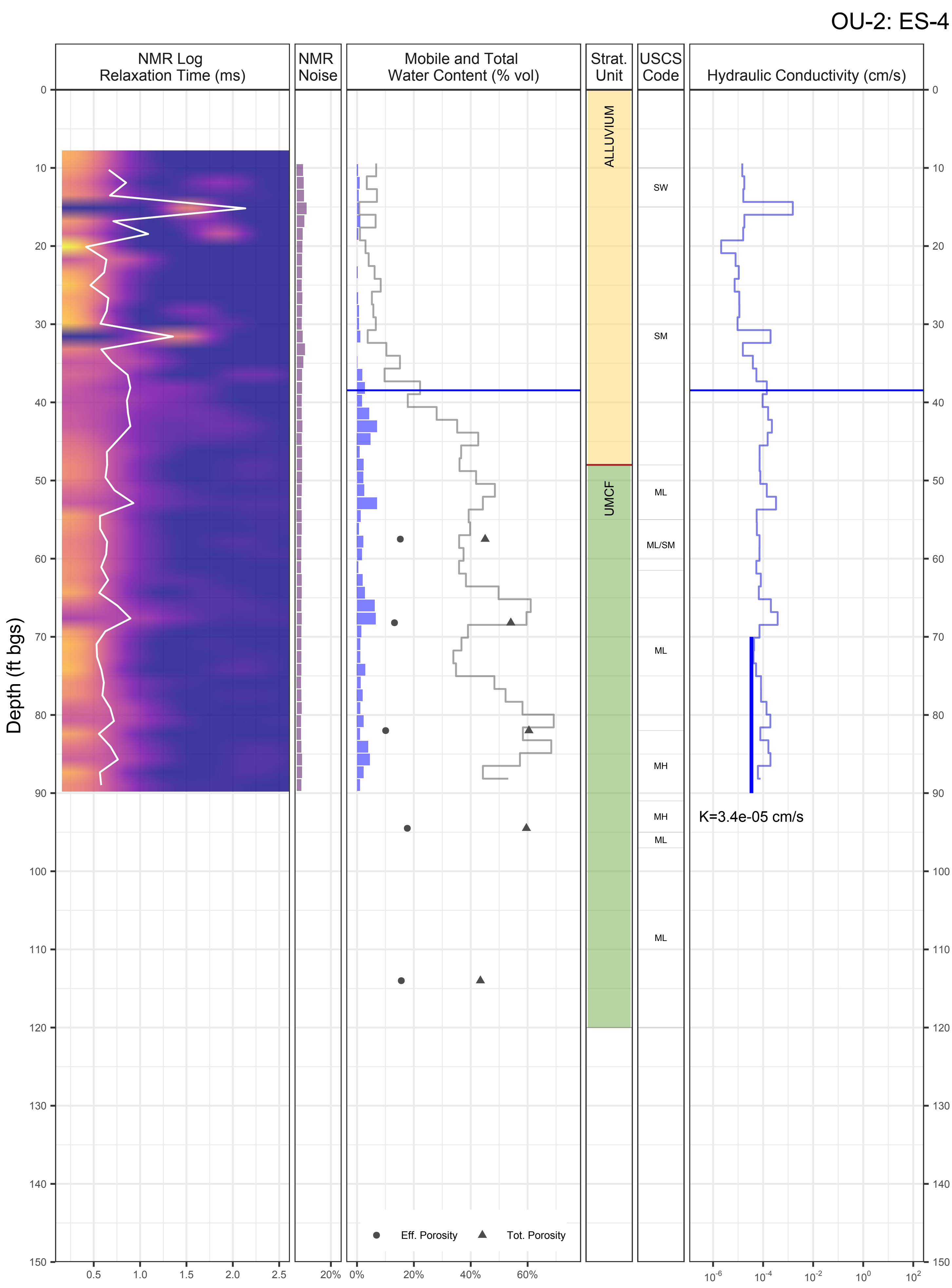
OU-1: TR-9

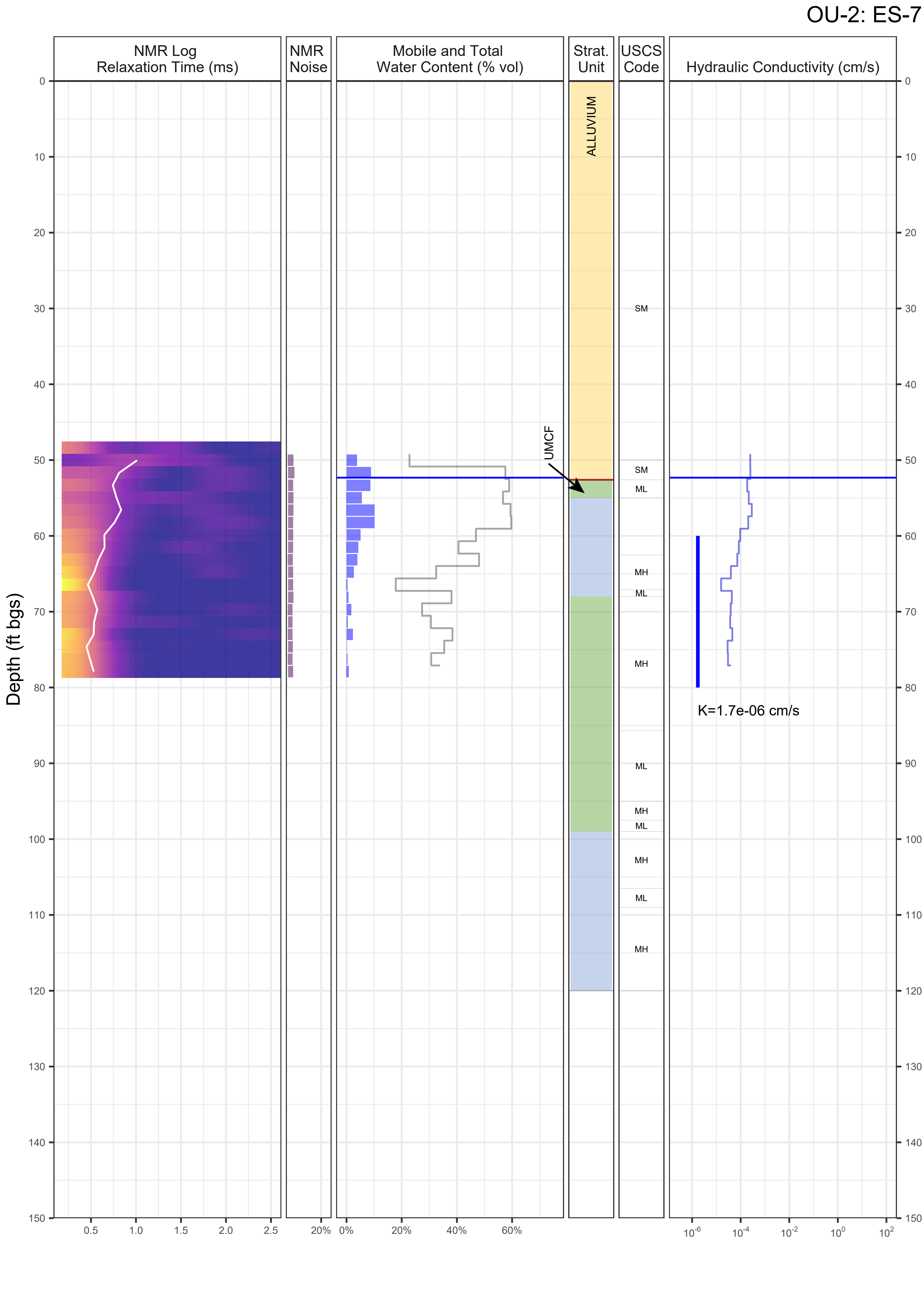

NMR Log
Relaxation Time (ms)
NMR
Noise
Mobile and Total
Water Content (% vol)
Strat.
Unit
USCS
Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
150
160
170
180
190
200
210
220
230
240
250
260
270
280
290
300
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
UMCF-fg
UMCF-cg2
ML
GW
K=1.0e-03 cm/s
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}

OU-2: ES-1



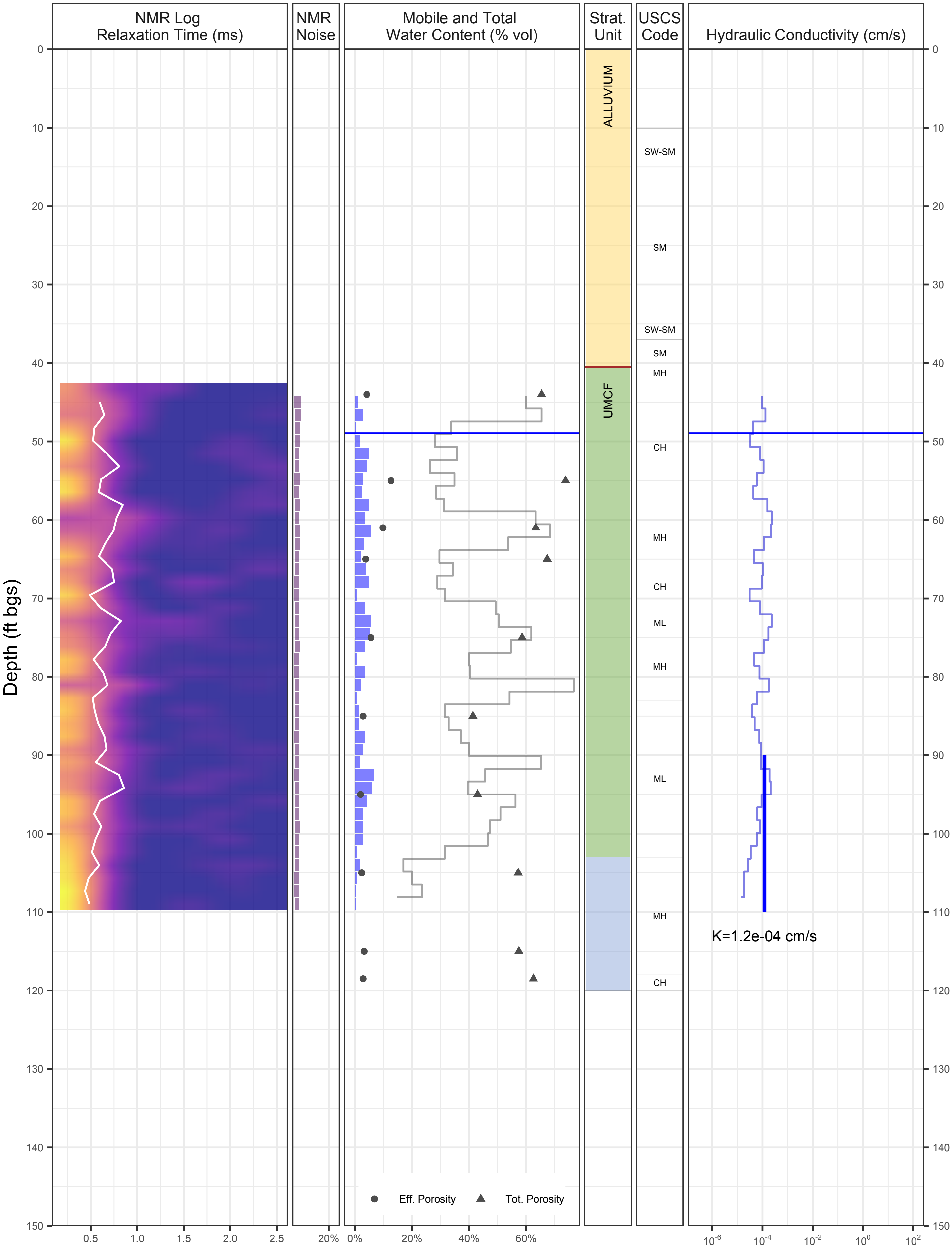
NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SP-SM
SM
SM
ML
ML
ML
ML
ML
ML
MH
ML
ML/SM
ML
ML
ML
CL
K=4.6e-05 cm/s
Eff. Porosity
Tot. Porosity
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150


OU-2: ES-4
NMR Log
Relaxation Time (ms)
NMR
Noise
Mobile and Total
Water Content (% vol)
Strat.
Unit
USCS
Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SW
SM
ML
ML/SM
ML
MH
MH
ML
ML
K=3.4e-05 cm/s
Eff. Porosity
Tot. Porosity
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}

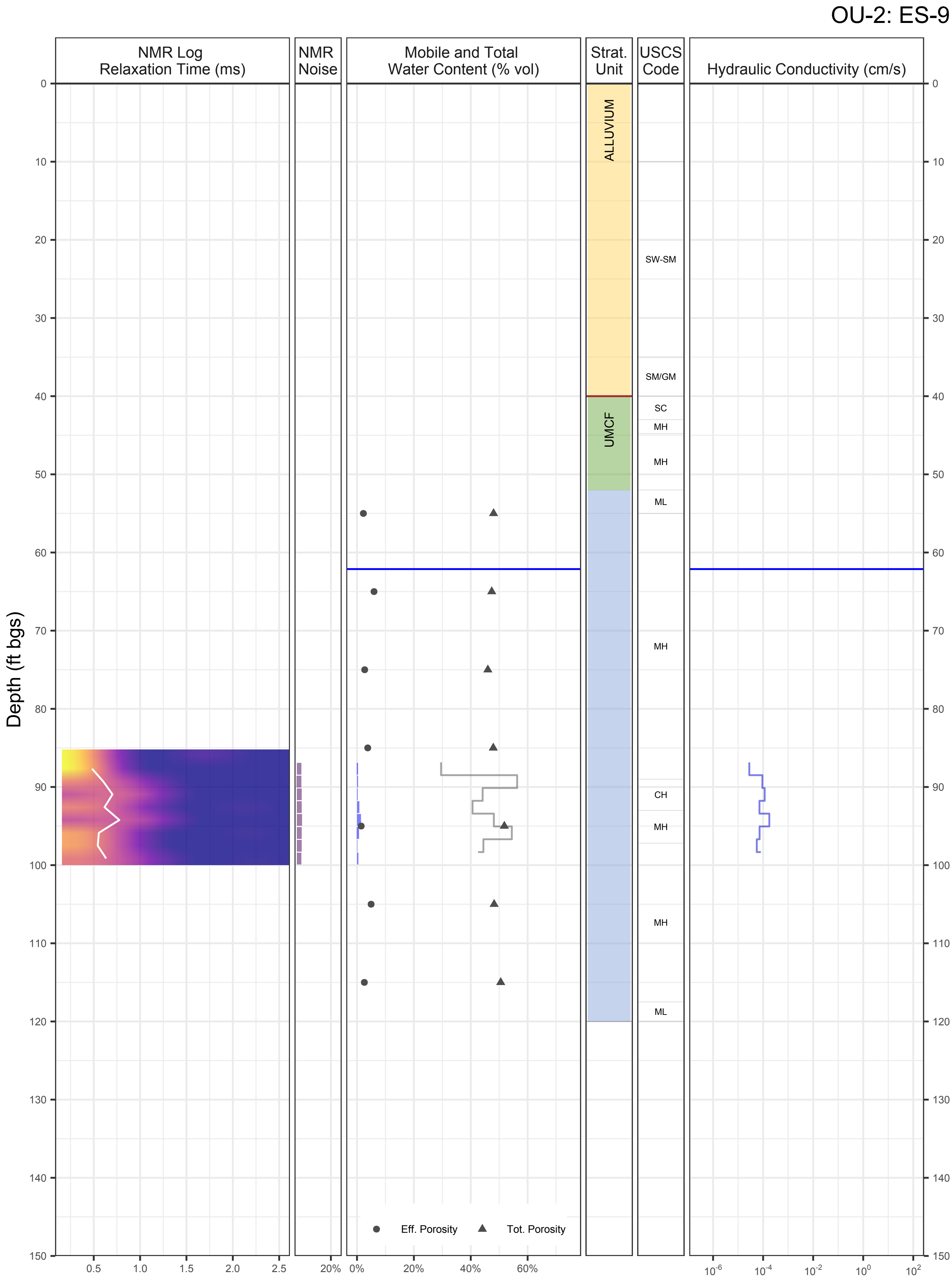


OU-2: ES-7
NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SM
SM
ML
MH
ML
MH
ML
MH
ML
MH
ML
MH
K=1.7e-06 cm/s
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}

OU-2: ES-8B

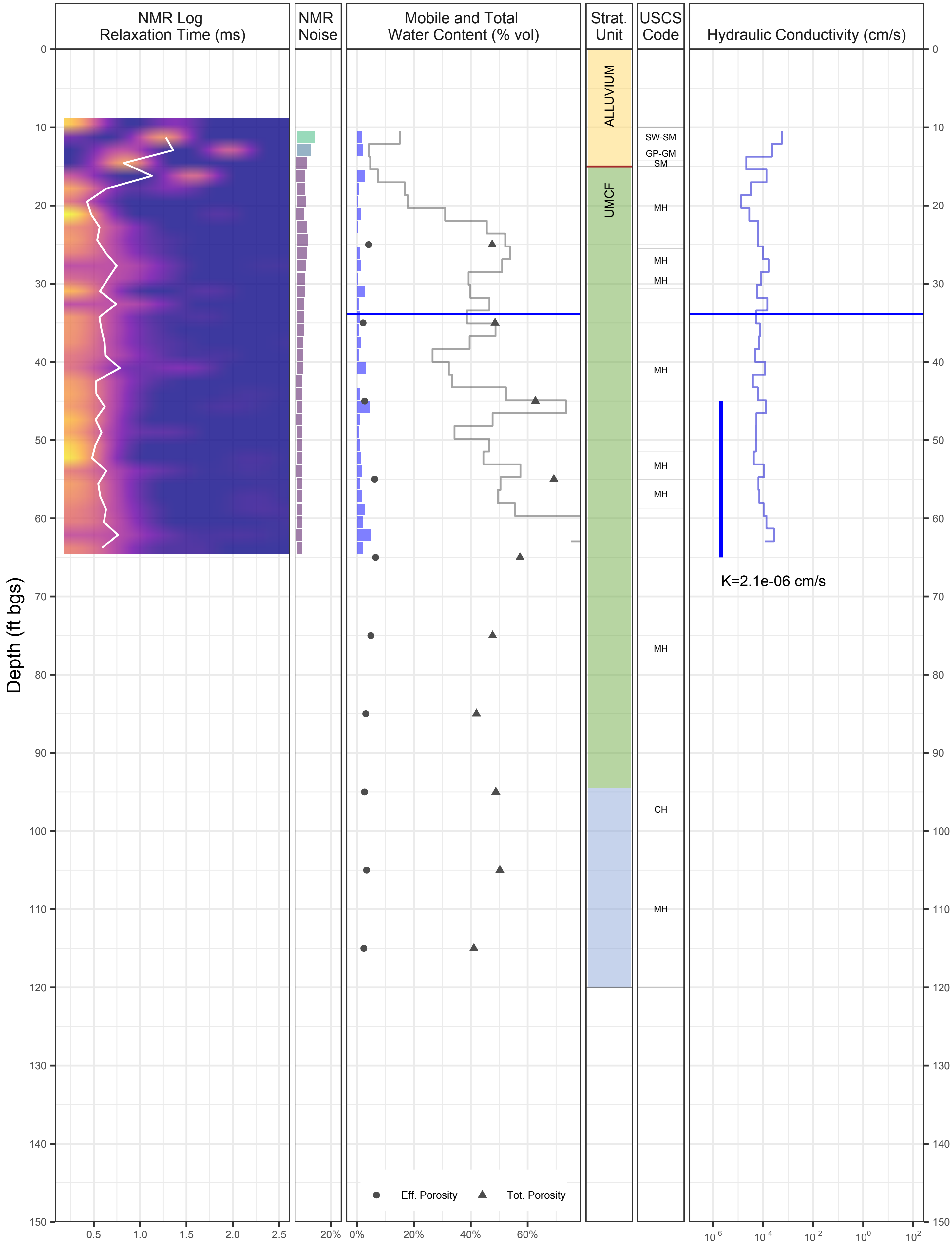


NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SW-SM
SM
SW-SM
SM
MH
CH
MH
CH
ML
MH
ML
MH
CH
K=1.2e-04 cm/s
Eff. Porosity
Tot. Porosity
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}



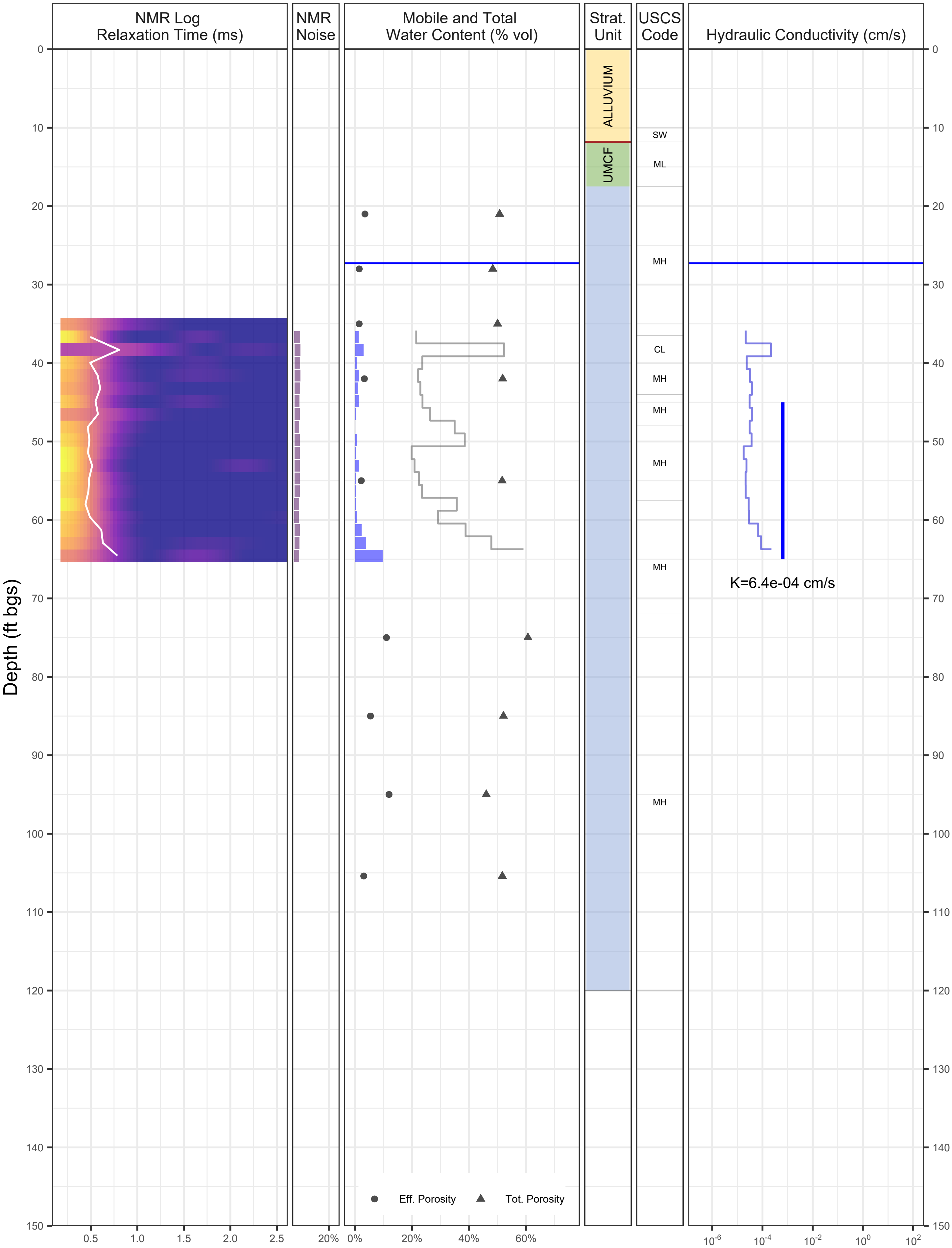
OU-2: ES-9
NMR Log Relaxation Time (ms)
NMR Noise
Mobile and Total Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SW-SM
SM/GM
SC
MH
MH
ML
MH
CH
MH
MH
ML
Eff. Porosity
Tot. Porosity
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150

OU-2: ES-10



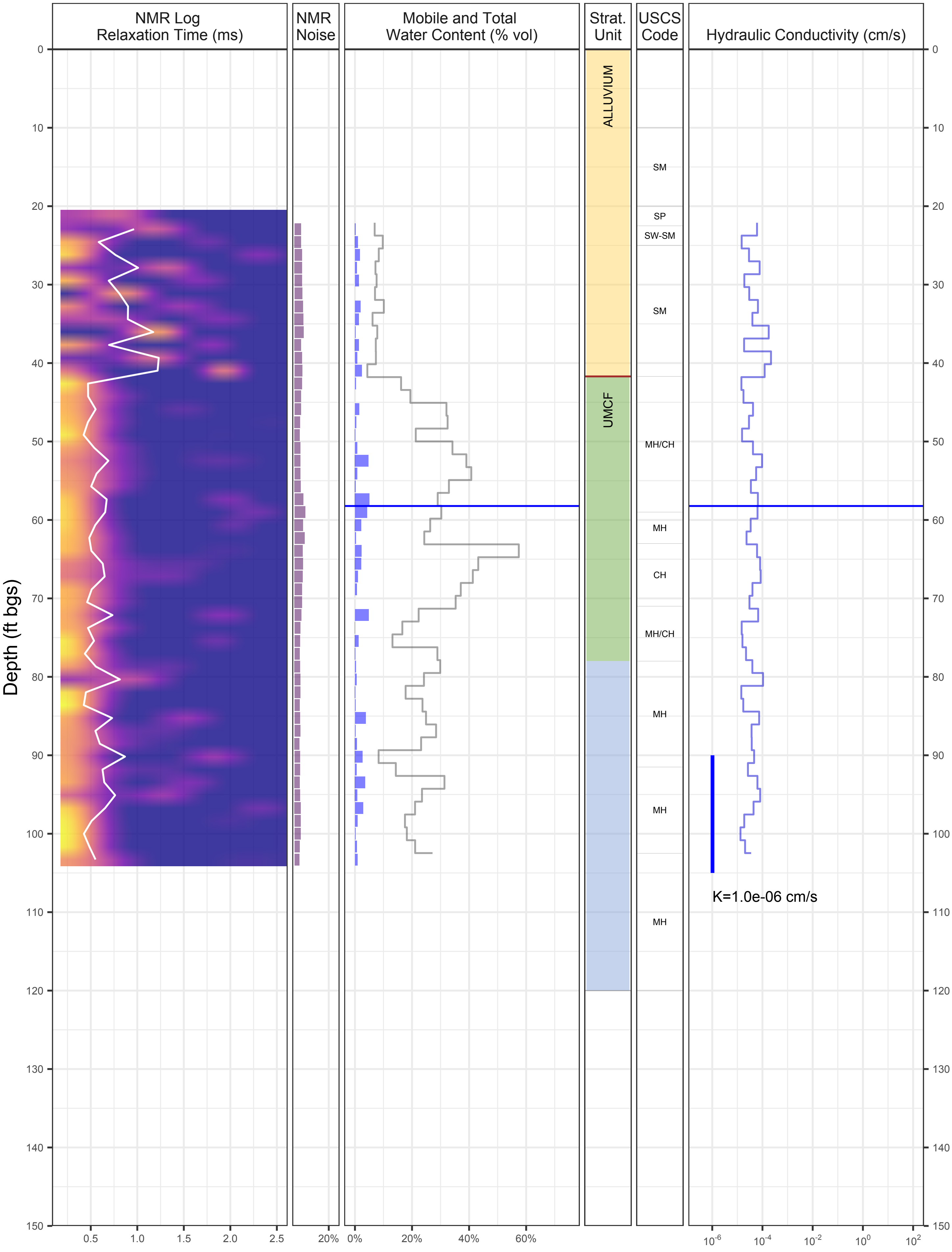
NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
ALLUVIUM
UMCF
SW-SM
GP-GM
SM
MH
MH
MH
MH
MH
MH
MH
CH
MH
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}
K=2.1e-06 cm/s
Eff. Porosity
Tot. Porosity

OU-2: ES-12

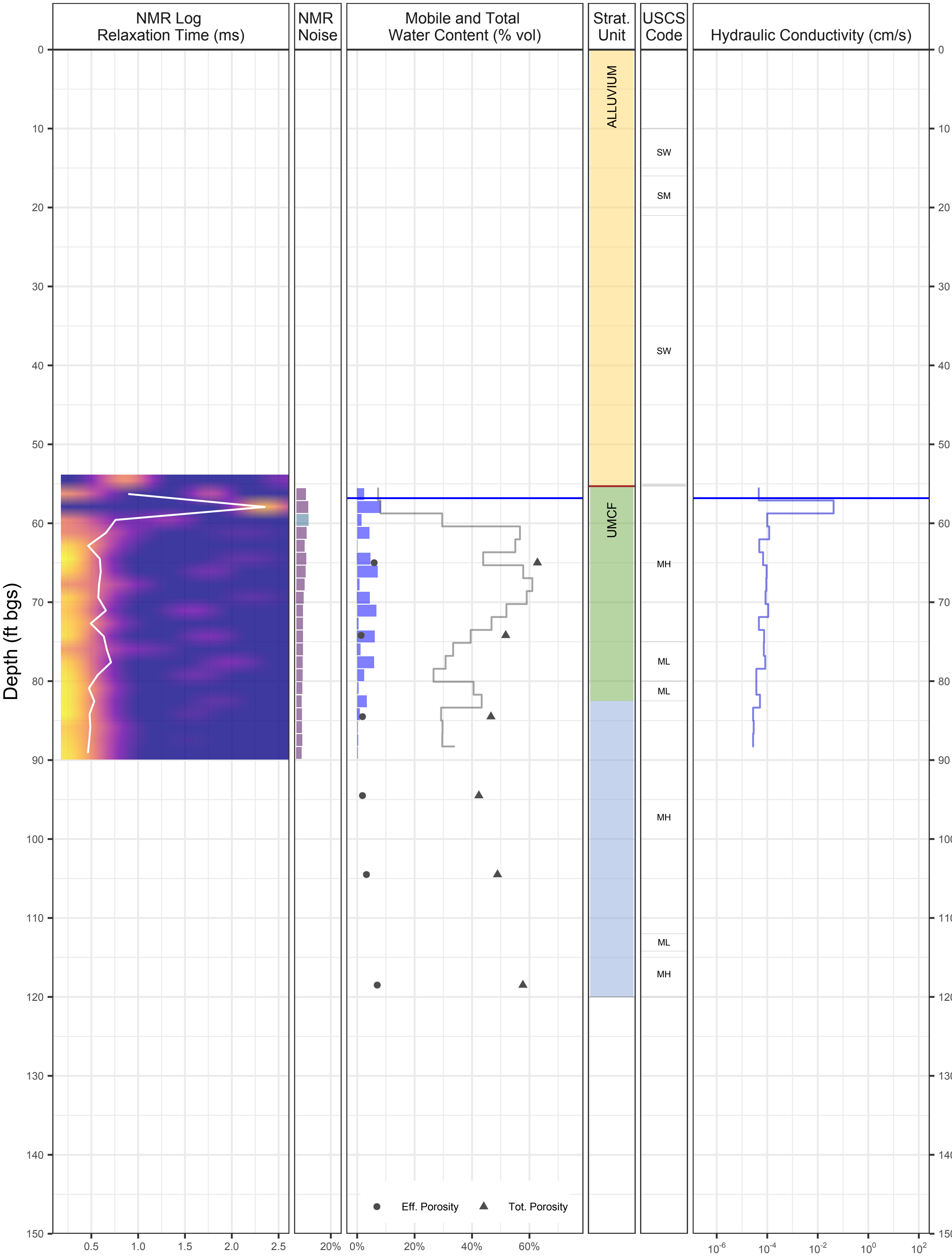


NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SW
ML
MH
CL
MH
MH
MH
MH
MH
K=6.4e-04 cm/s
Eff. Porosity
Tot. Porosity
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150

OU-2: ES-13

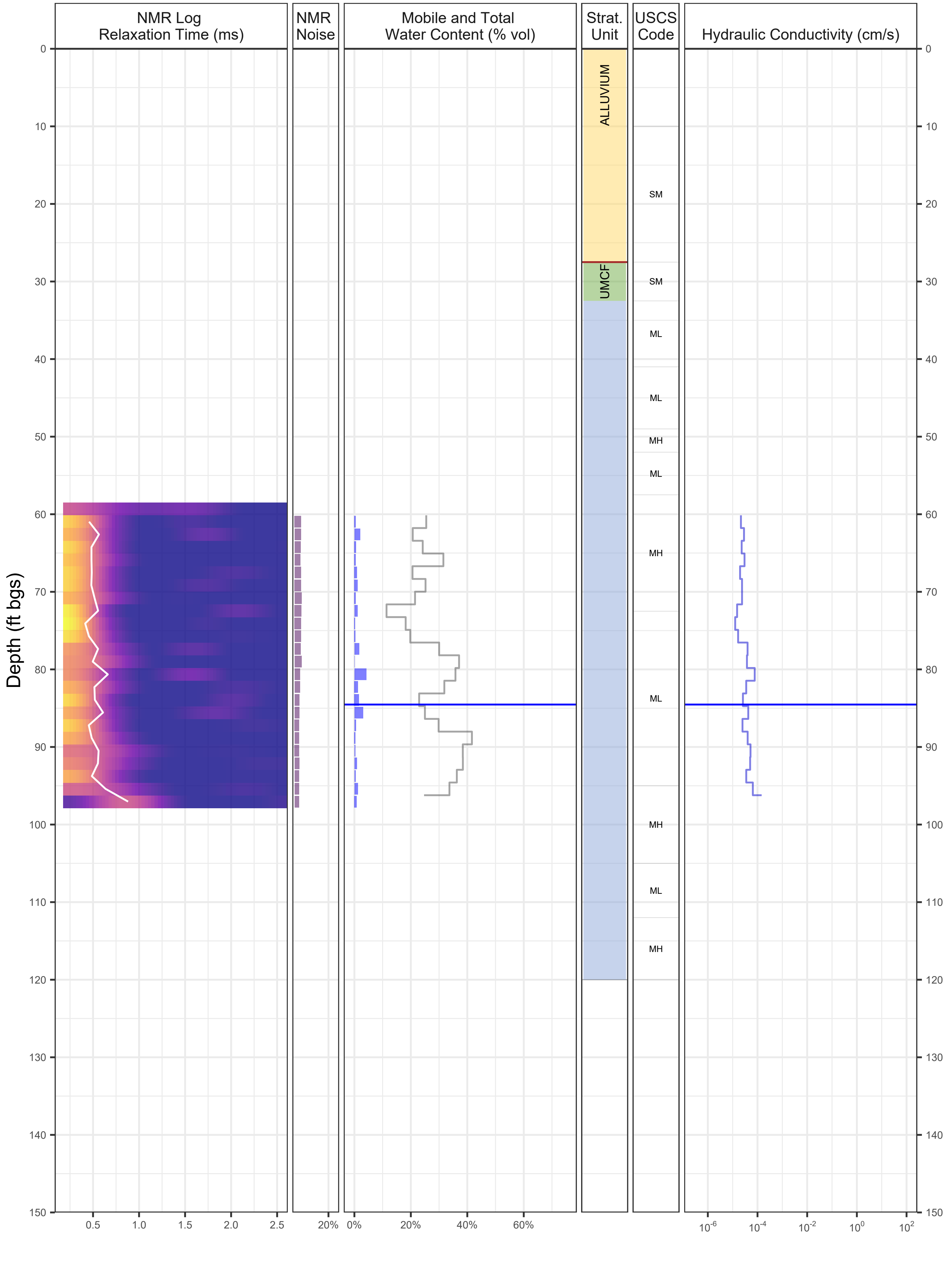

NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SM
SP
SW-SM
SM
MH/CH
MH
CH
MH/CH
MH
MH
MH
K=1.0e-06 cm/s
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}

OU-2: ES-15



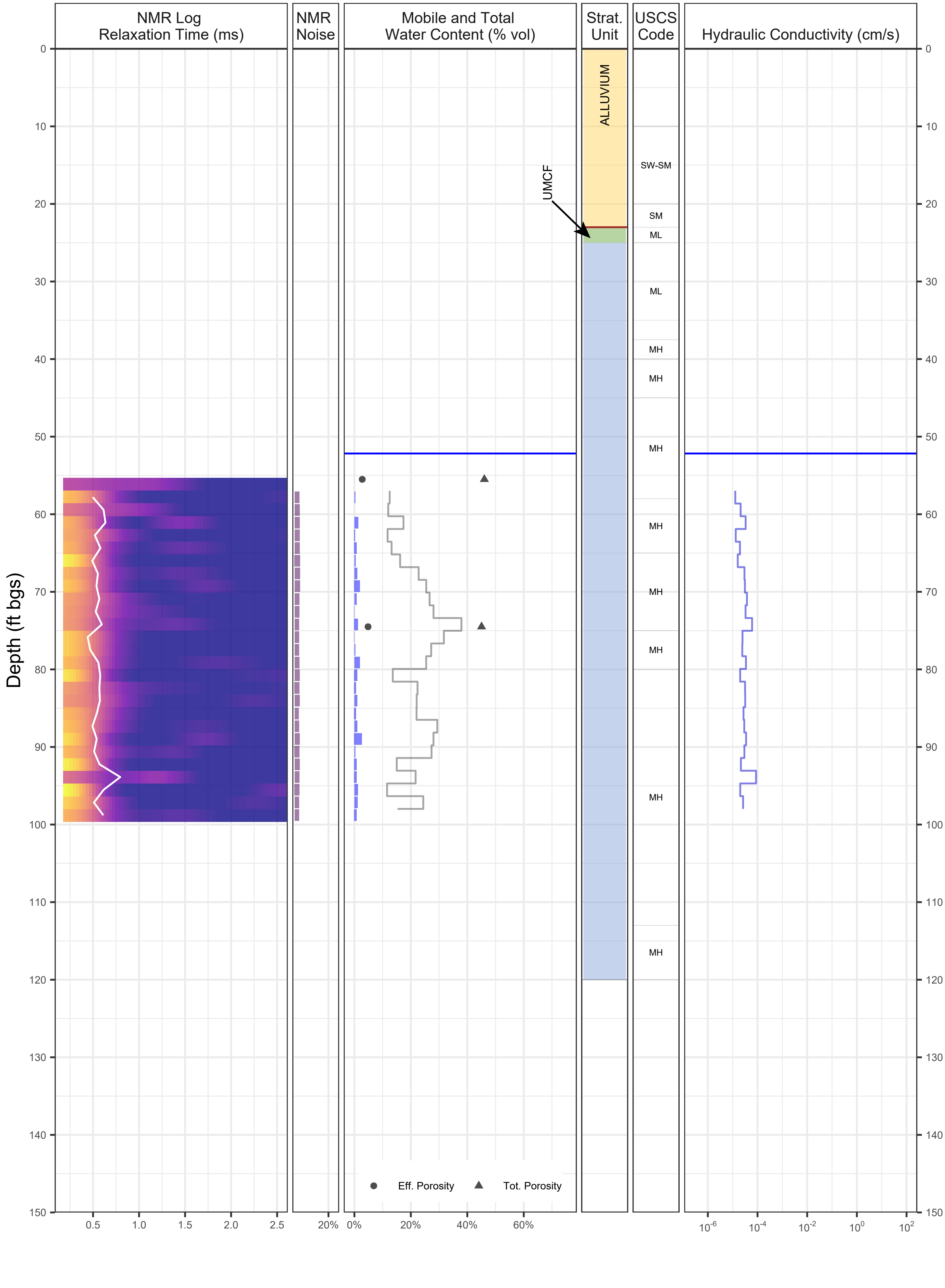
NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SW
SM
SW
MH
ML
ML
MH
ML
MH
Eff. Porosity
Tot. Porosity
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}

OU-2: ES-16



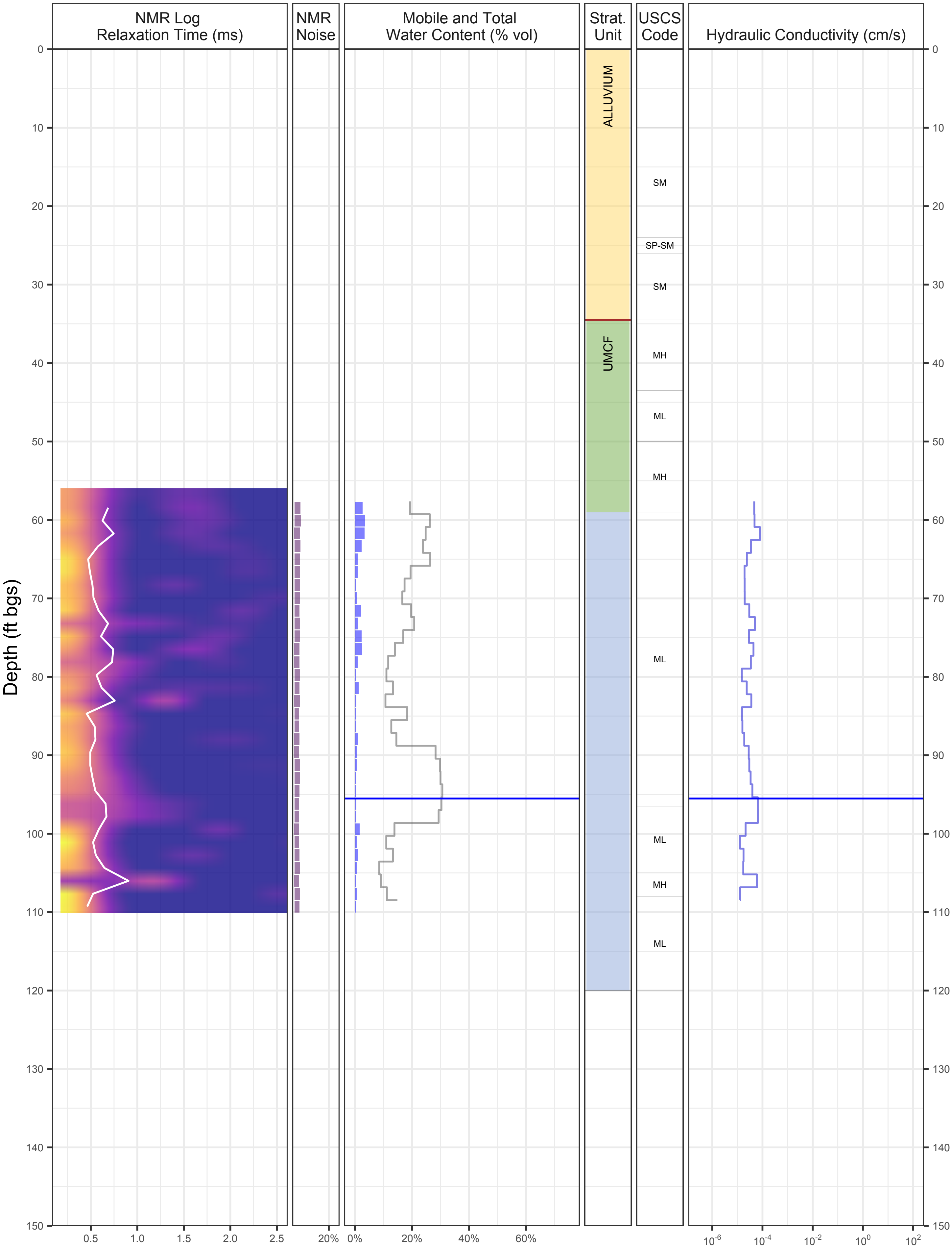
NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
ALLUVIUM
UMCF
SM
SM
ML
ML
MH
ML
MH
ML
MH
ML
MH
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}

OU-2: ES-17

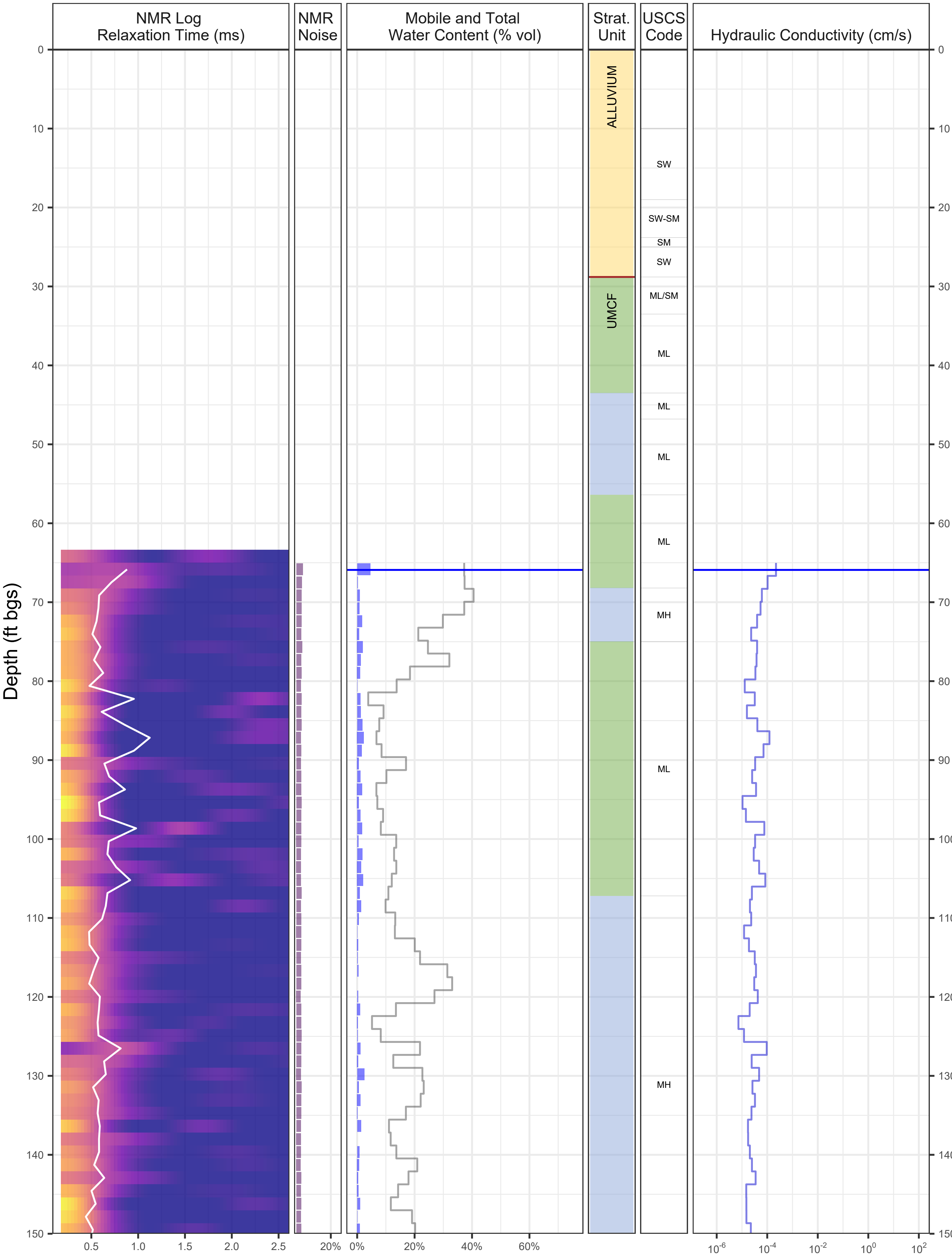


NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SW-SM
SM
ML
ML
MH
MH
MH
MH
MH
MH
MH
MH
Eff. Porosity
Tot. Porosity
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150

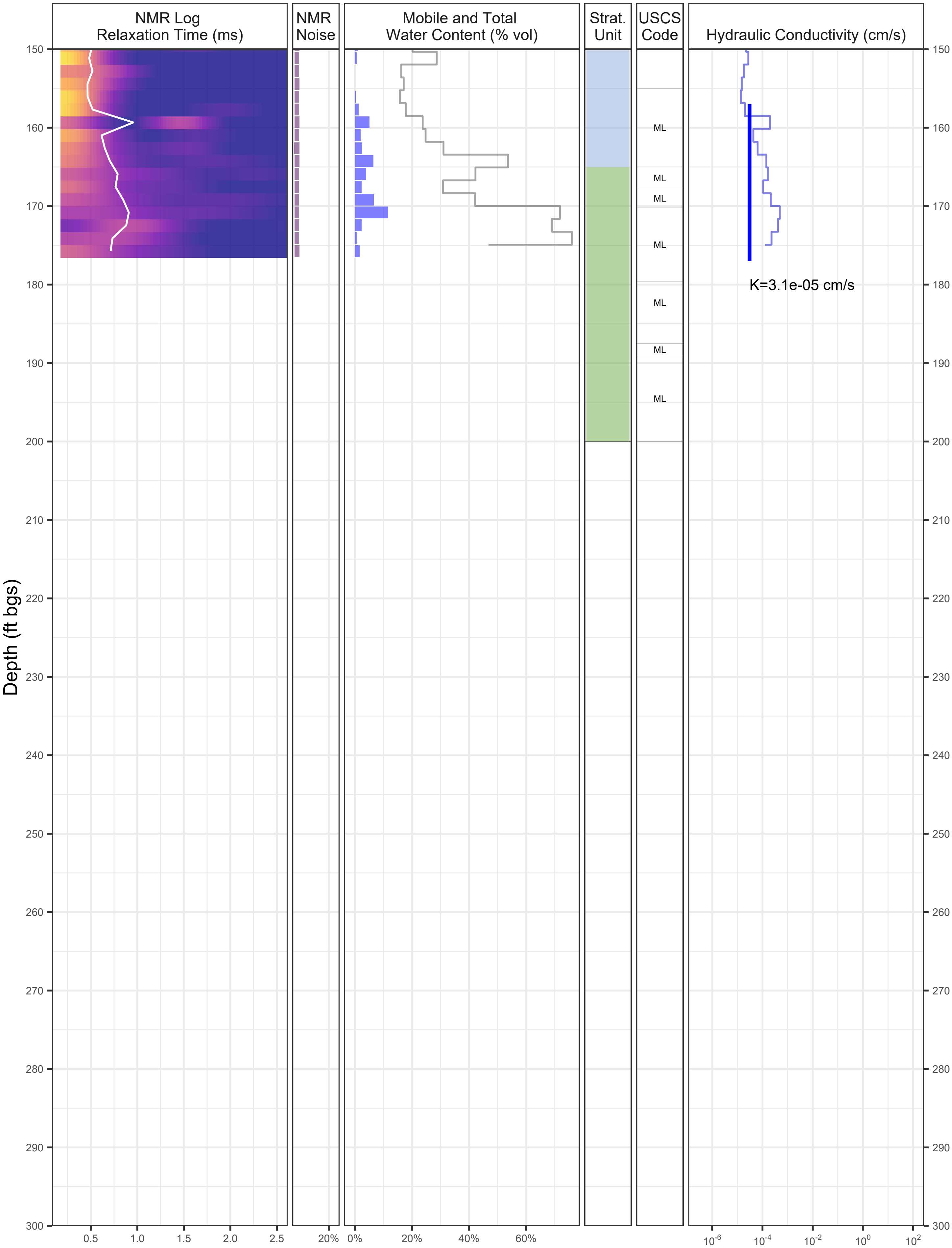
OU-2: ES-18


NMR Log
Relaxation Time (ms)
NMR
Noise
Mobile and Total
Water Content (% vol)
Strat.
Unit
USCS
Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SM
SP-SM
SM
MH
ML
MH
ML
ML
MH
ML
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}

OU-2: ES-19

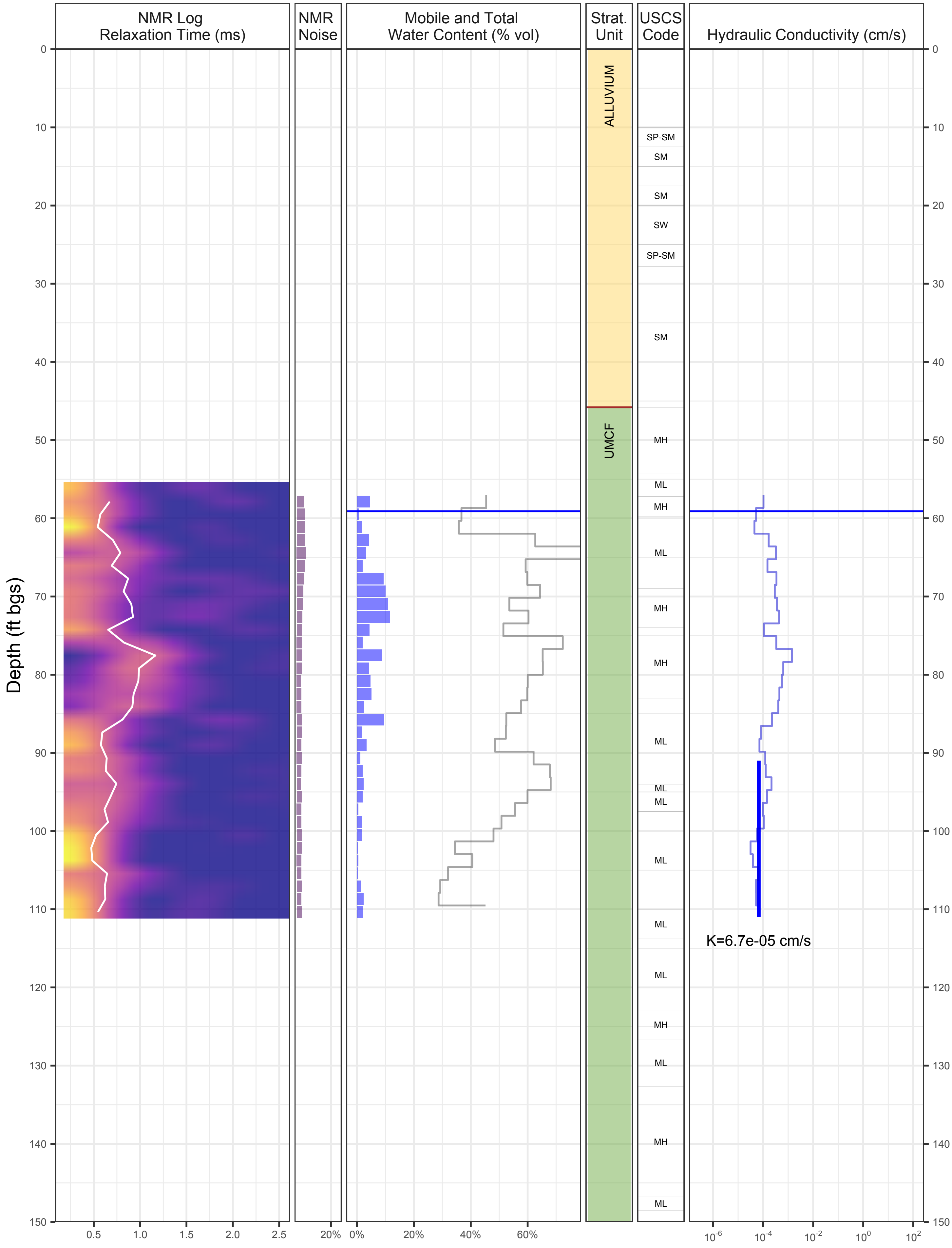

NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SW
SW-SM
SM
SW
ML/SM
ML
ML
ML
ML
MH
ML
MH
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}

OU-2: ES-19



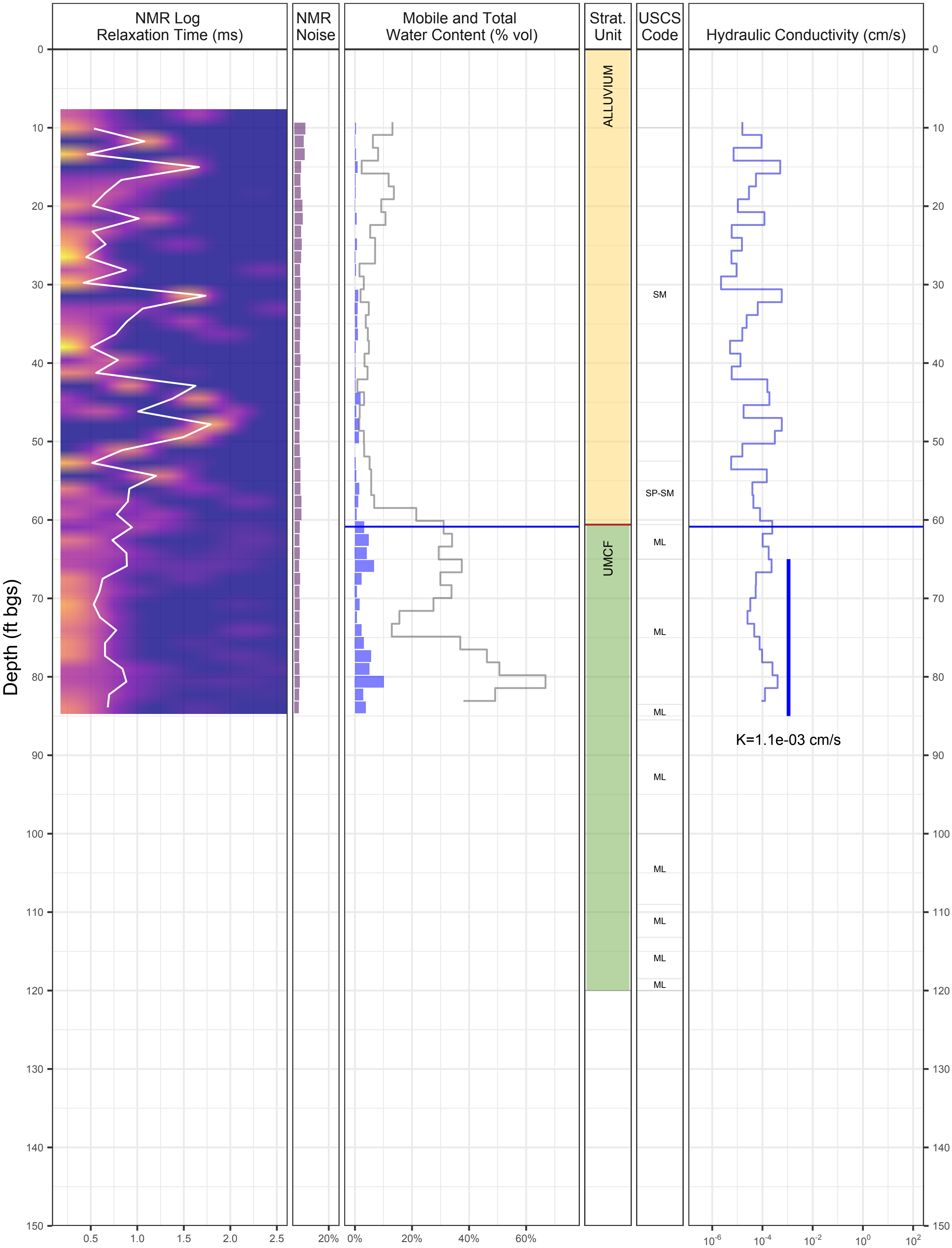
NMR Log
Relaxation Time (ms)
NMR
Noise
Mobile and Total
Water Content (% vol)
Strat.
Unit
USCS
Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ML
ML
ML
ML
ML
ML
ML
K=3.1e-05 cm/s
150
160
170
180
190
200
210
220
230
240
250
260
270
280
290
300
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}

OU-2: ES-20

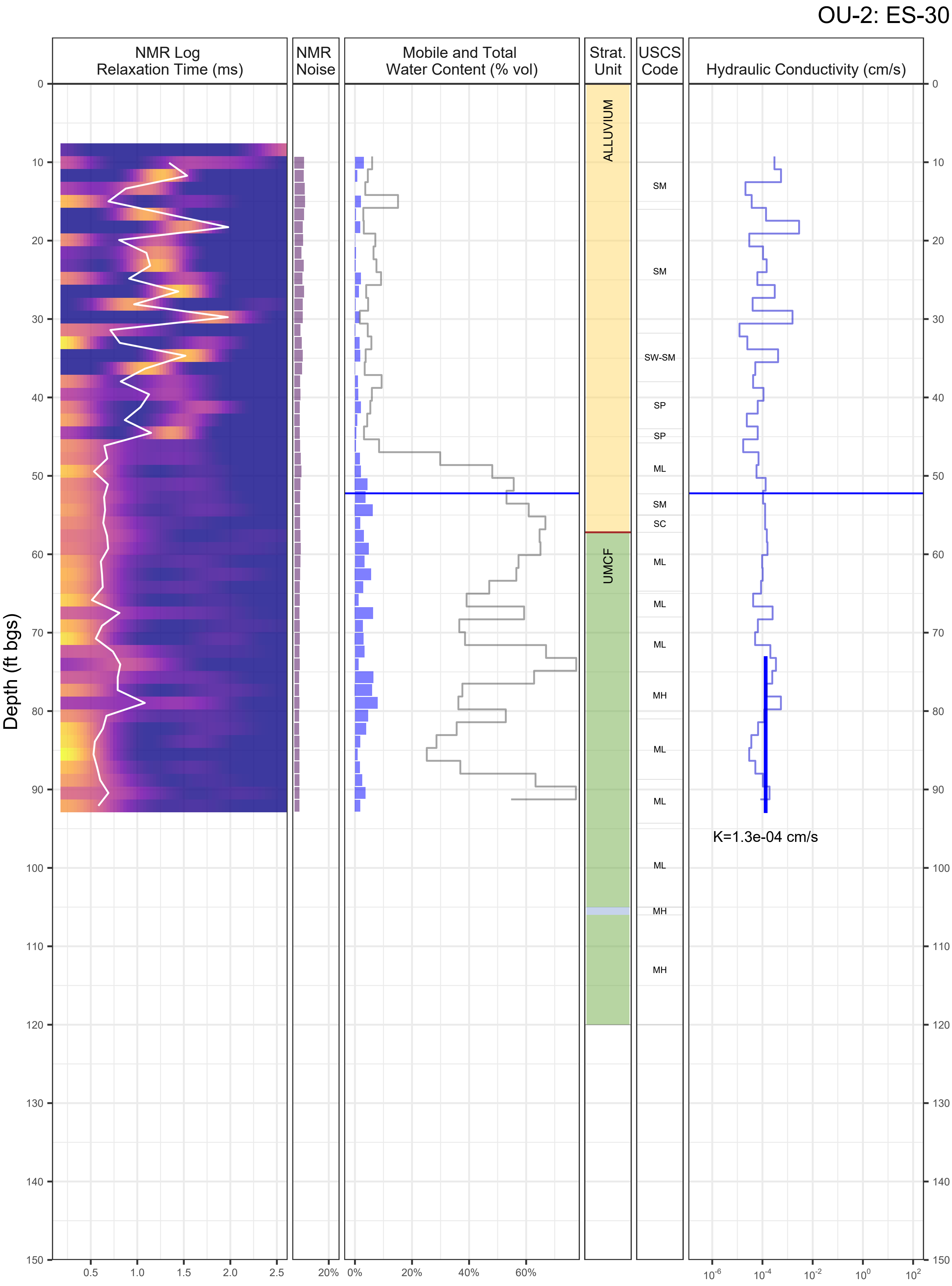


NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}
ALLUVIUM
UMCF
SP-SM
SM
SM
SW
SP-SM
SM
MH
ML
MH
ML
MH
MH
ML
ML
ML
ML
ML
ML
MH
ML
MH
ML
K=6.7e-05 cm/s

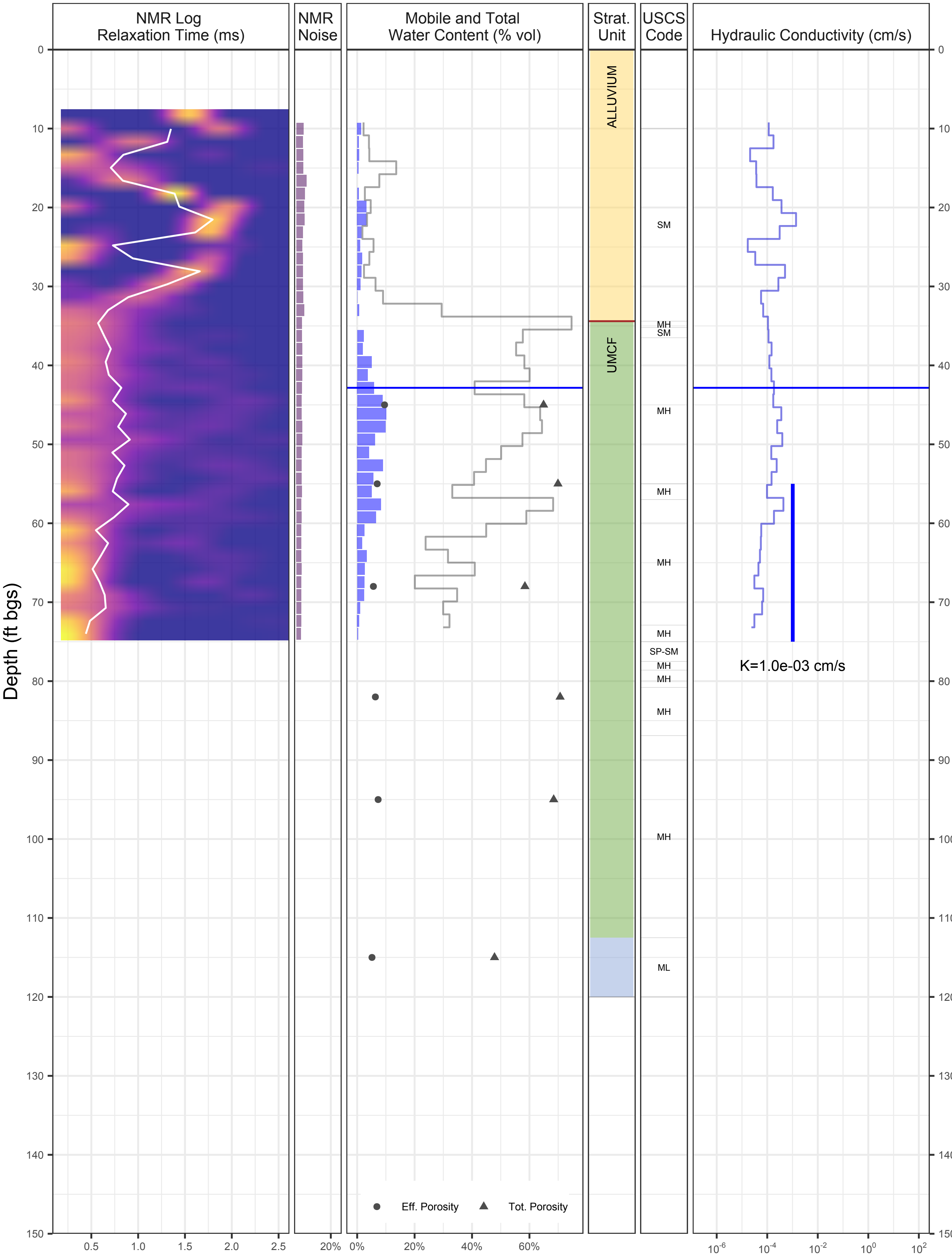
OU-2: ES-28



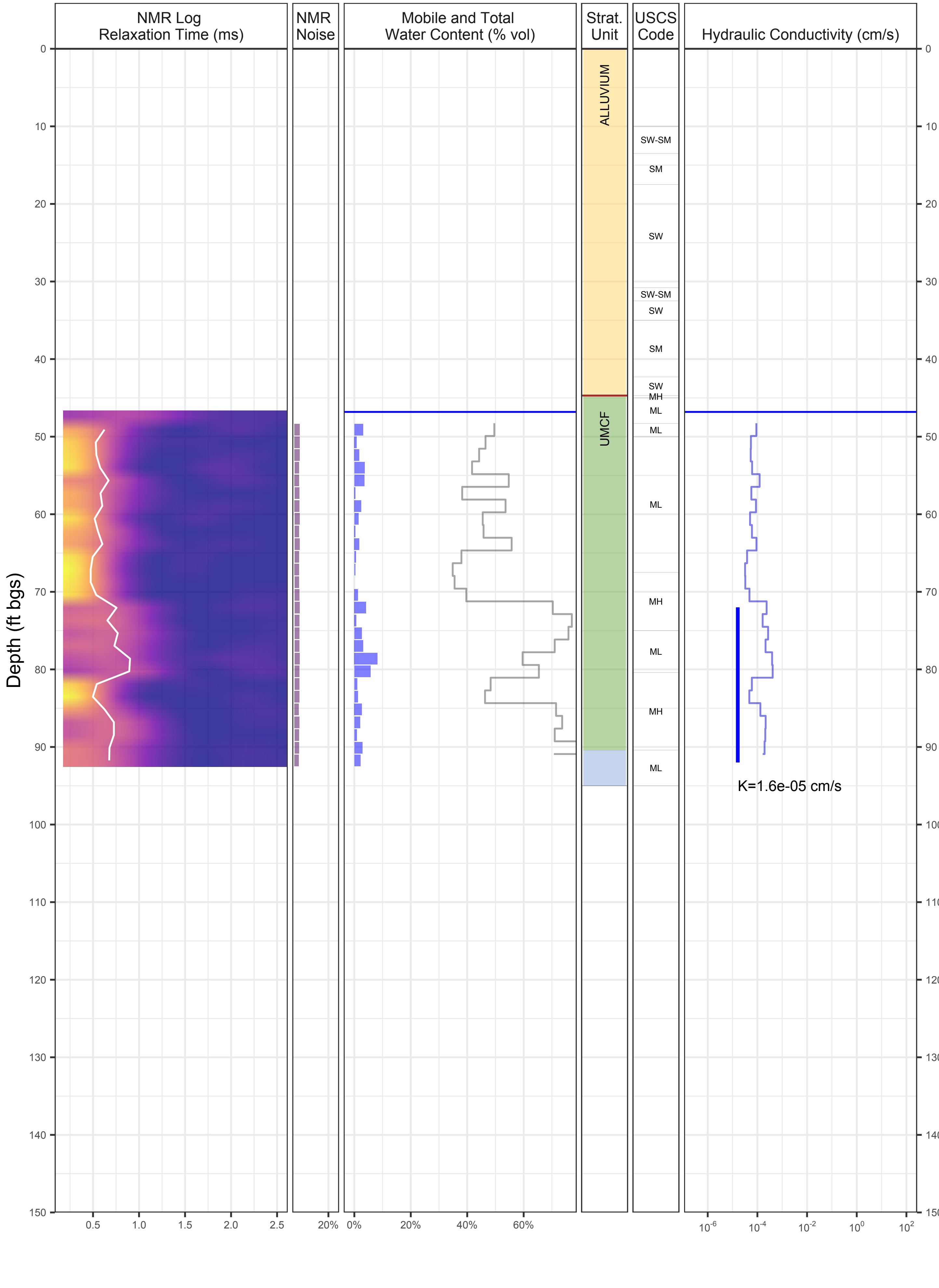
NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SM
SP-SM
ML
K=1.1e-03 cm/s
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}



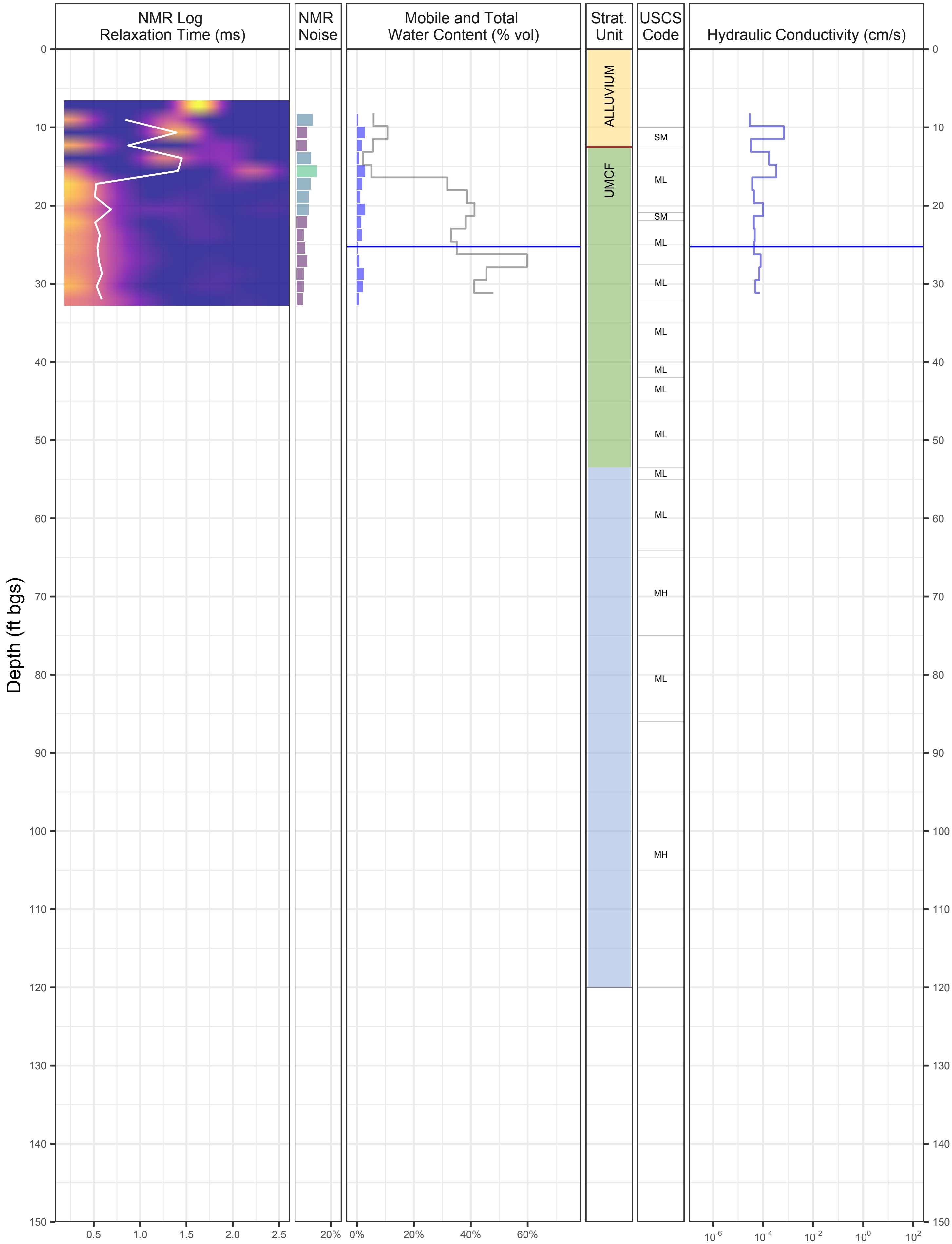
OU-2: ES-30
NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SM
SM
SW-SM
SP
SP
ML
SM
SC
ML
ML
ML
MH
ML
ML
ML
MH
MH
K=1.3e-04 cm/s
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}


NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SM
MH
SM
MH
MH
MH
MH
SP-SM
MH
MH
MH
MH
ML
K=1.0e-03 cm/s
Eff. Porosity
Tot. Porosity
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150

OU-2: ES-32

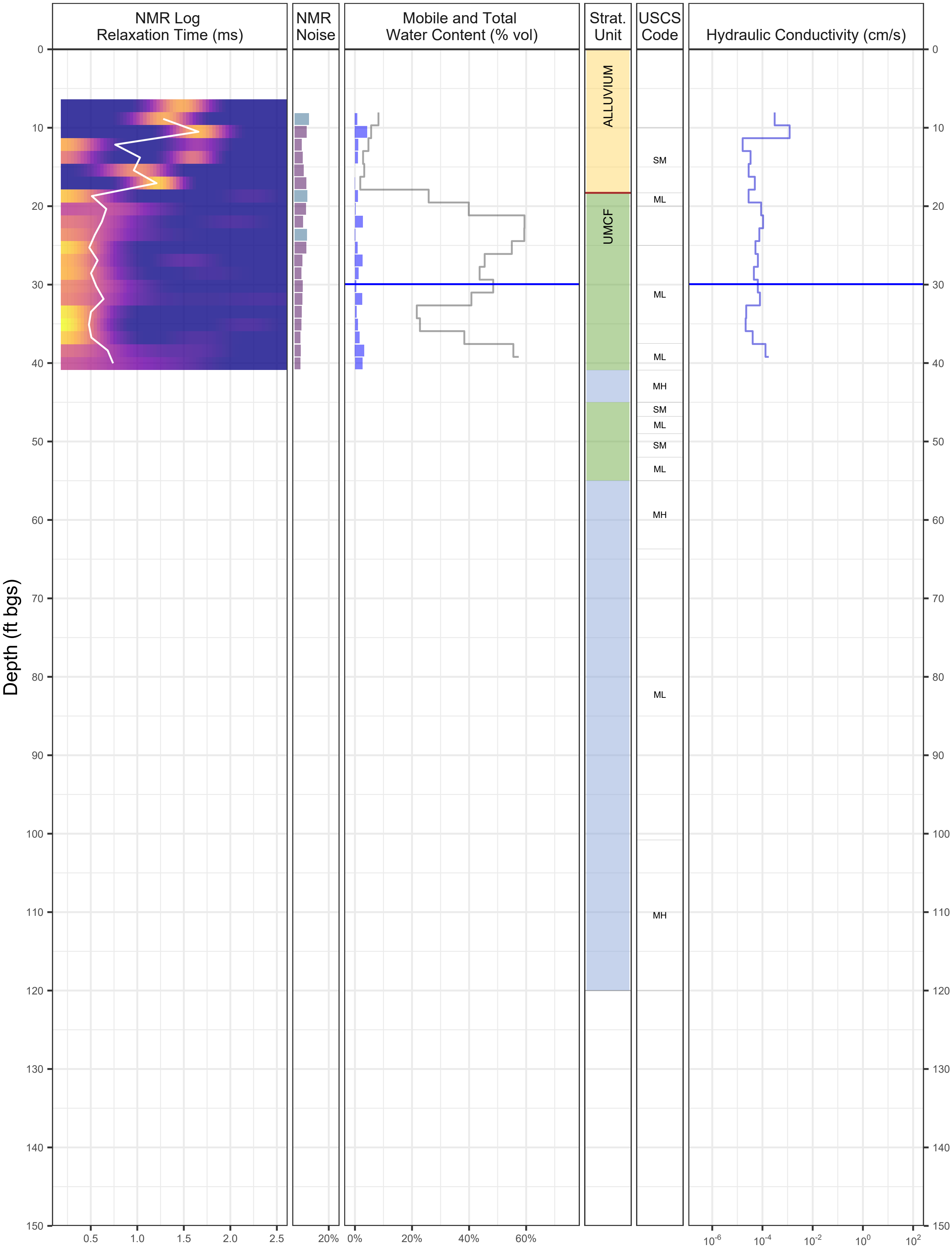

NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SW-SM
SM
SW
SW-SM
SW
SM
SW
MH
ML
ML
ML
MH
ML
MH
ML
K=1.6e-05 cm/s
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%

OU-2: ES-33

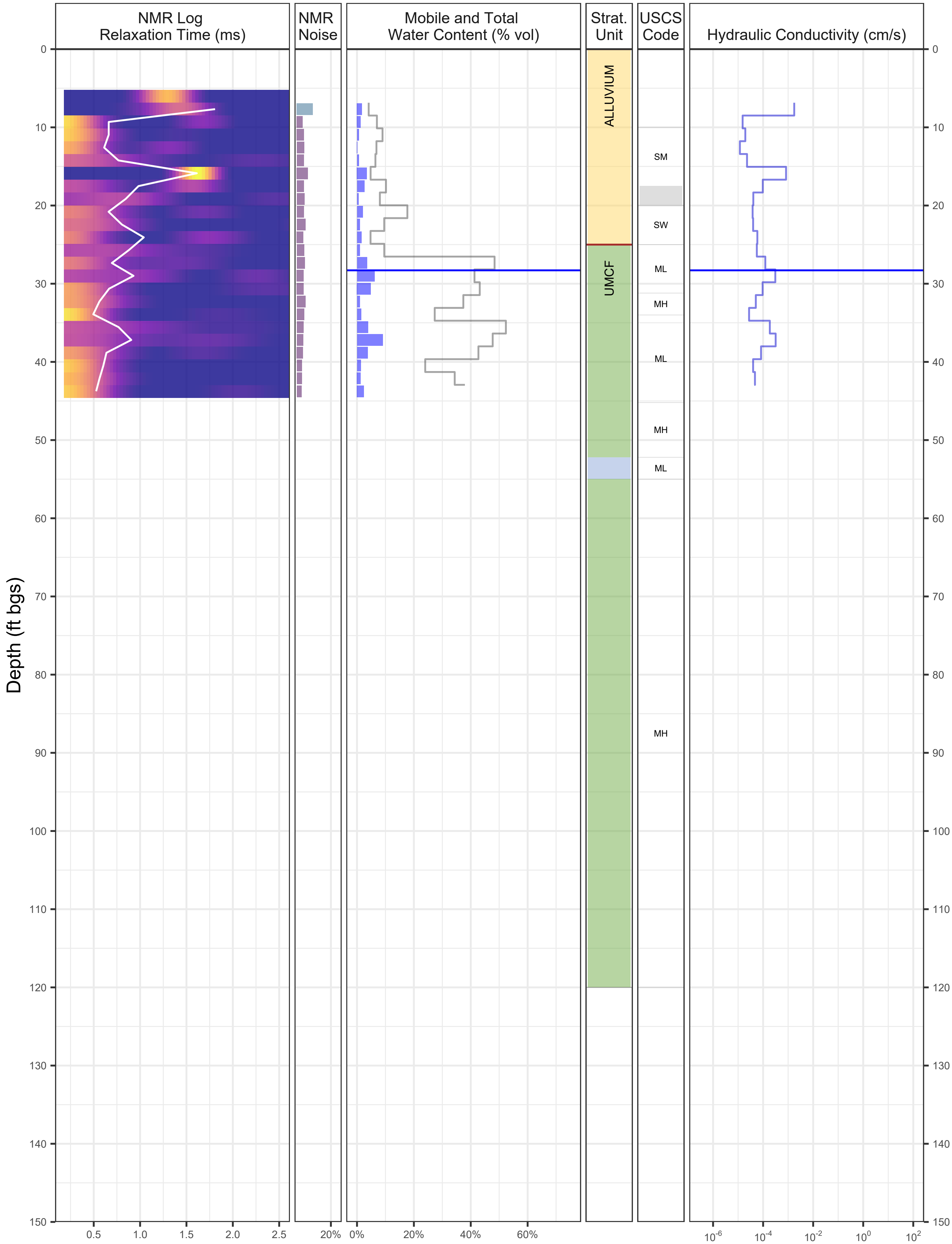


NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SM
ML
SM
ML
ML
ML
ML
ML
ML
ML
ML
MH
ML
MH
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}

OU-2: ES-34

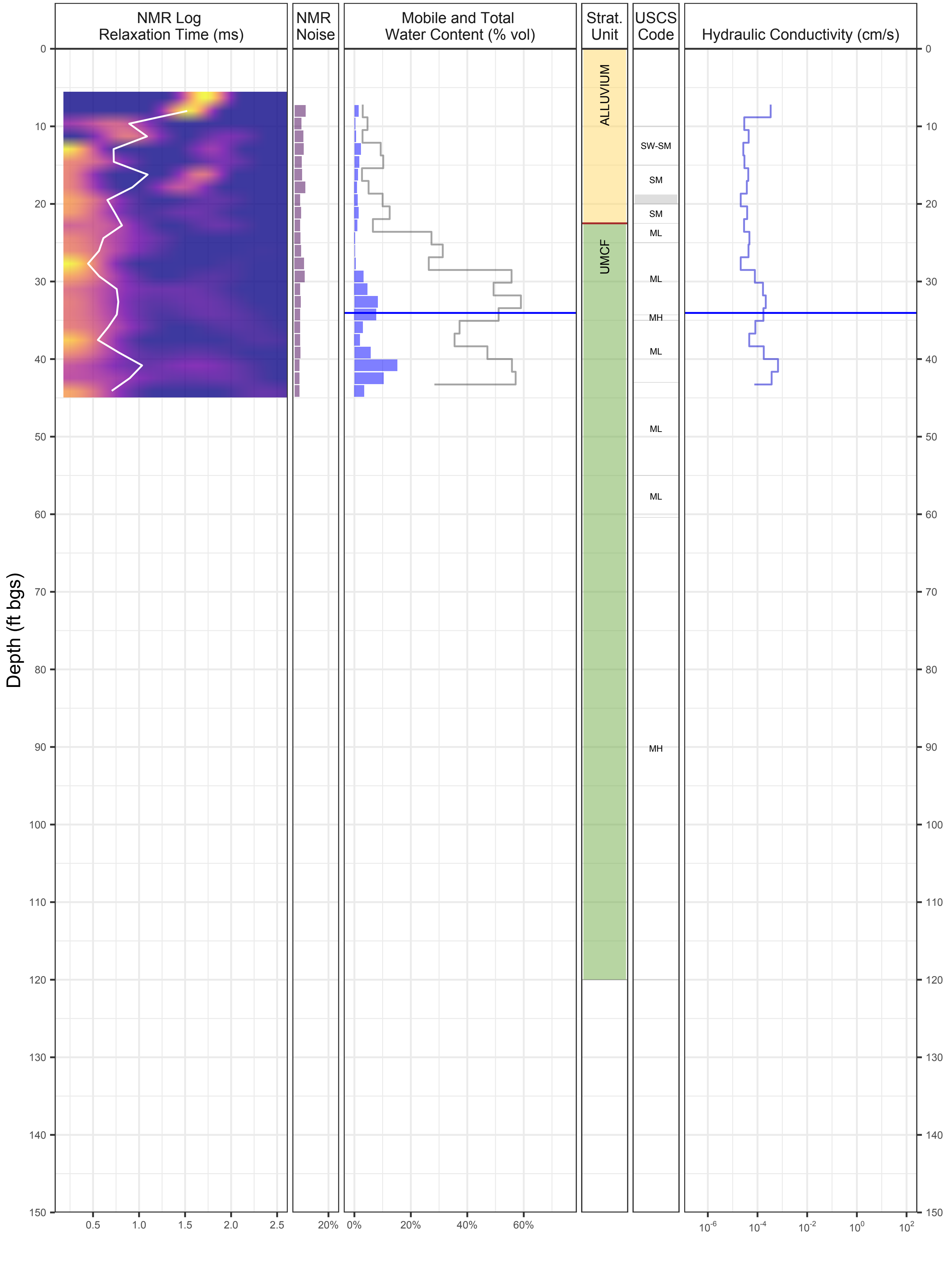

NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SM
ML
ML
ML
MH
SM
ML
SM
ML
MH
ML
MH
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150

OU-2: ES-35



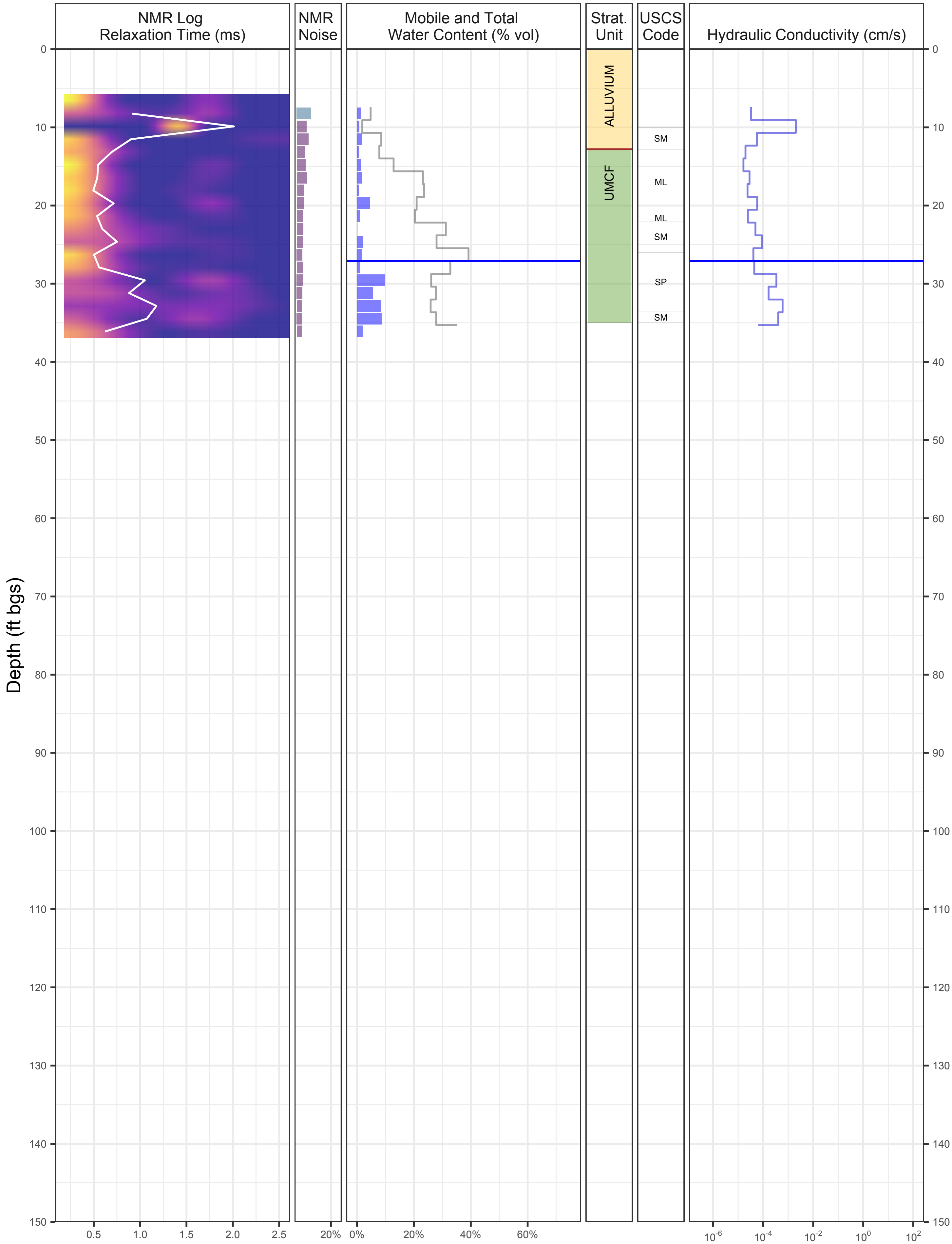
NMR Log
Relaxation Time (ms)
NMR
Noise
Mobile and Total
Water Content (% vol)
Strat.
Unit
USCS
Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SM
SW
ML
MH
ML
MH
ML
MH
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^-6
10^-4
10^-2
10^0
10^2

OU-2: ES-36



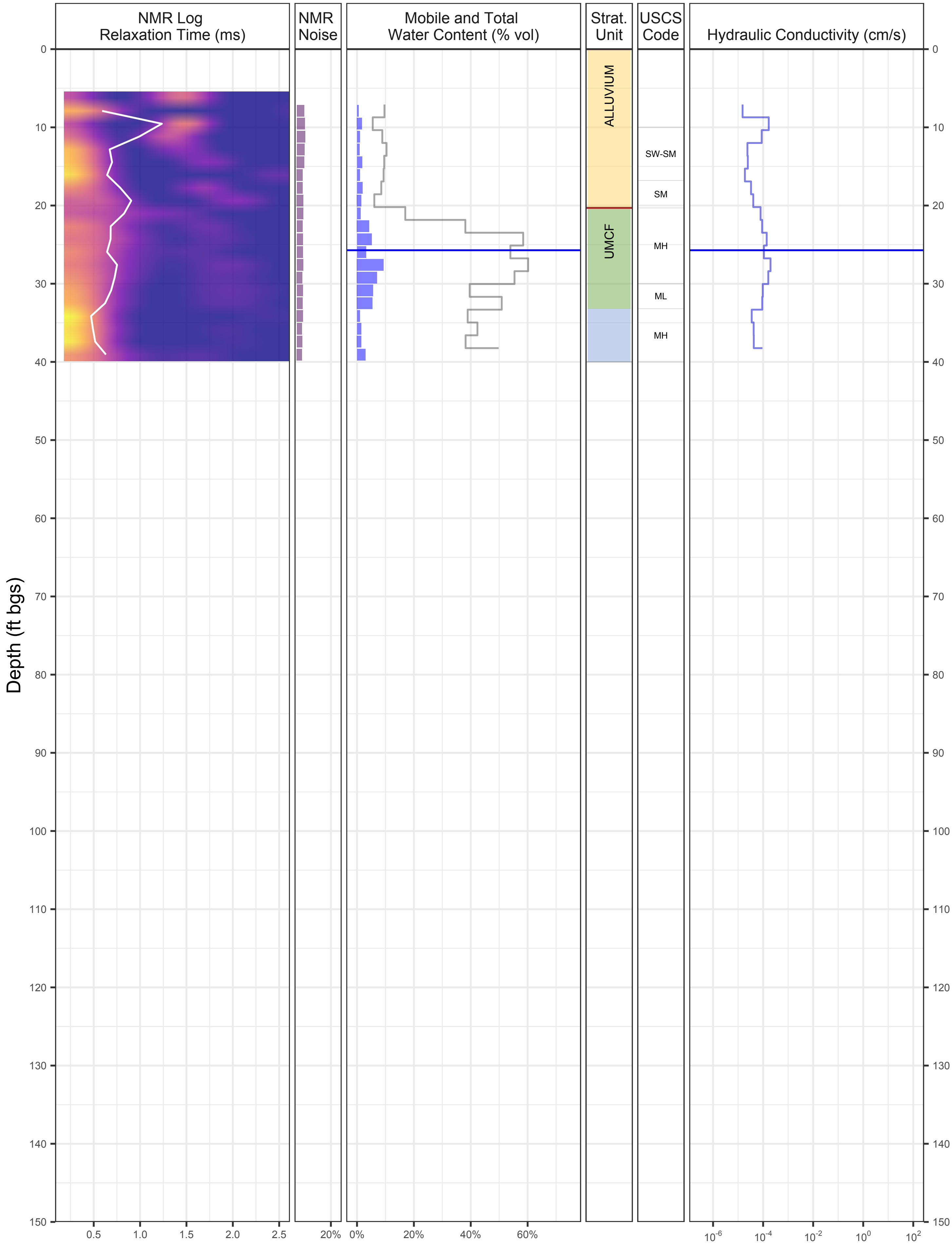
NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SW-SM
SM
SM
ML
ML
MH
ML
ML
ML
MH
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150

OU-2: ES-37

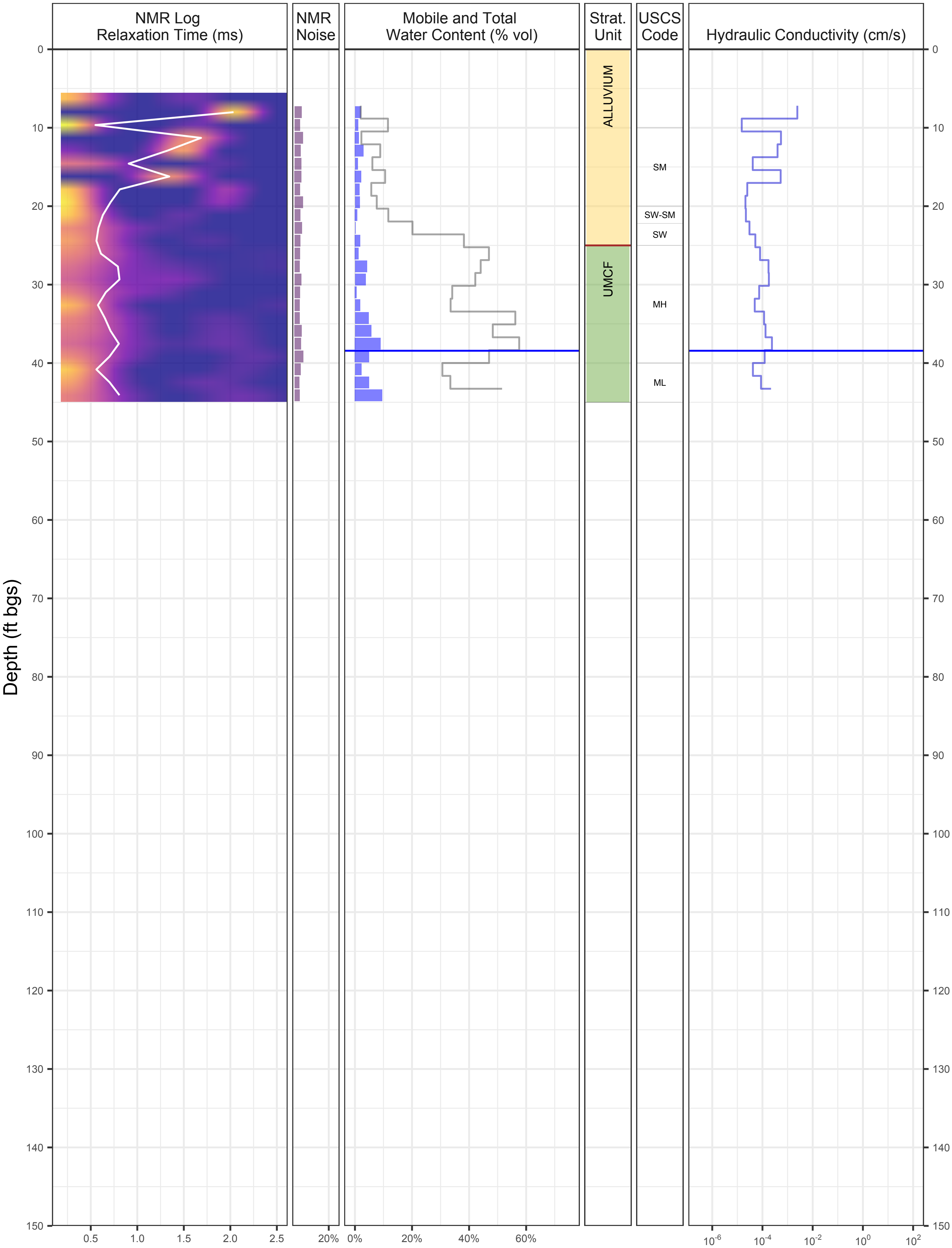


NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SM
ML
ML
SM
SP
SM
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150
0.5 1.0 1.5 2.0 2.5
20%
0% 20% 40% 60%
10^{-6} 10^{-4} 10^{-2} 10^{0} 10^{2}

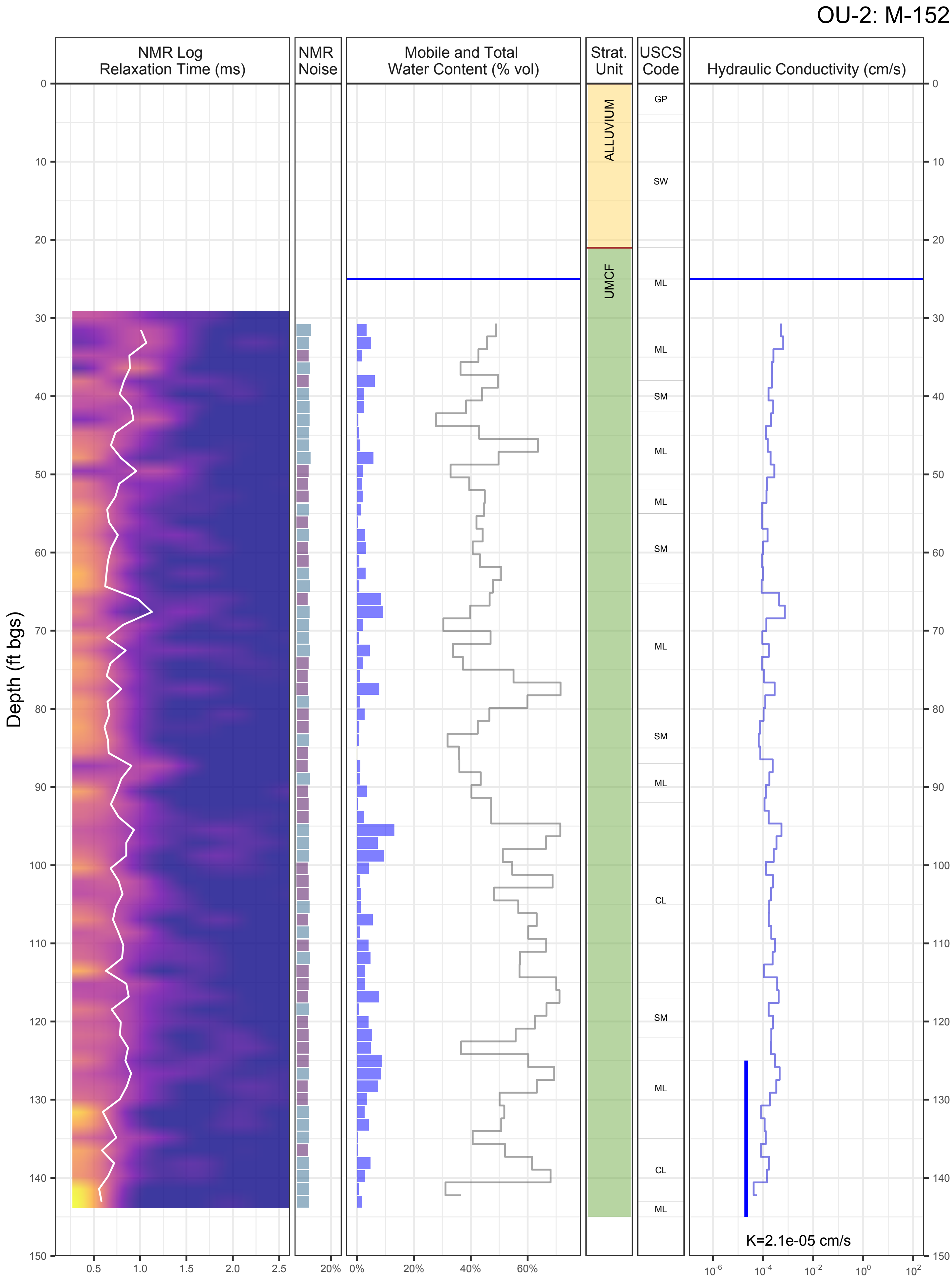
OU-2: ES-38


NMR Log
Relaxation Time (ms)
NMR
Noise
Mobile and Total
Water Content (% vol)
Strat.
Unit
USCS
Code
Hydraulic Conductivity (cm/s)
ALLUVIUM
UMCF
SW-SM
SM
MH
ML
MH
Depth (ft bgs)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}

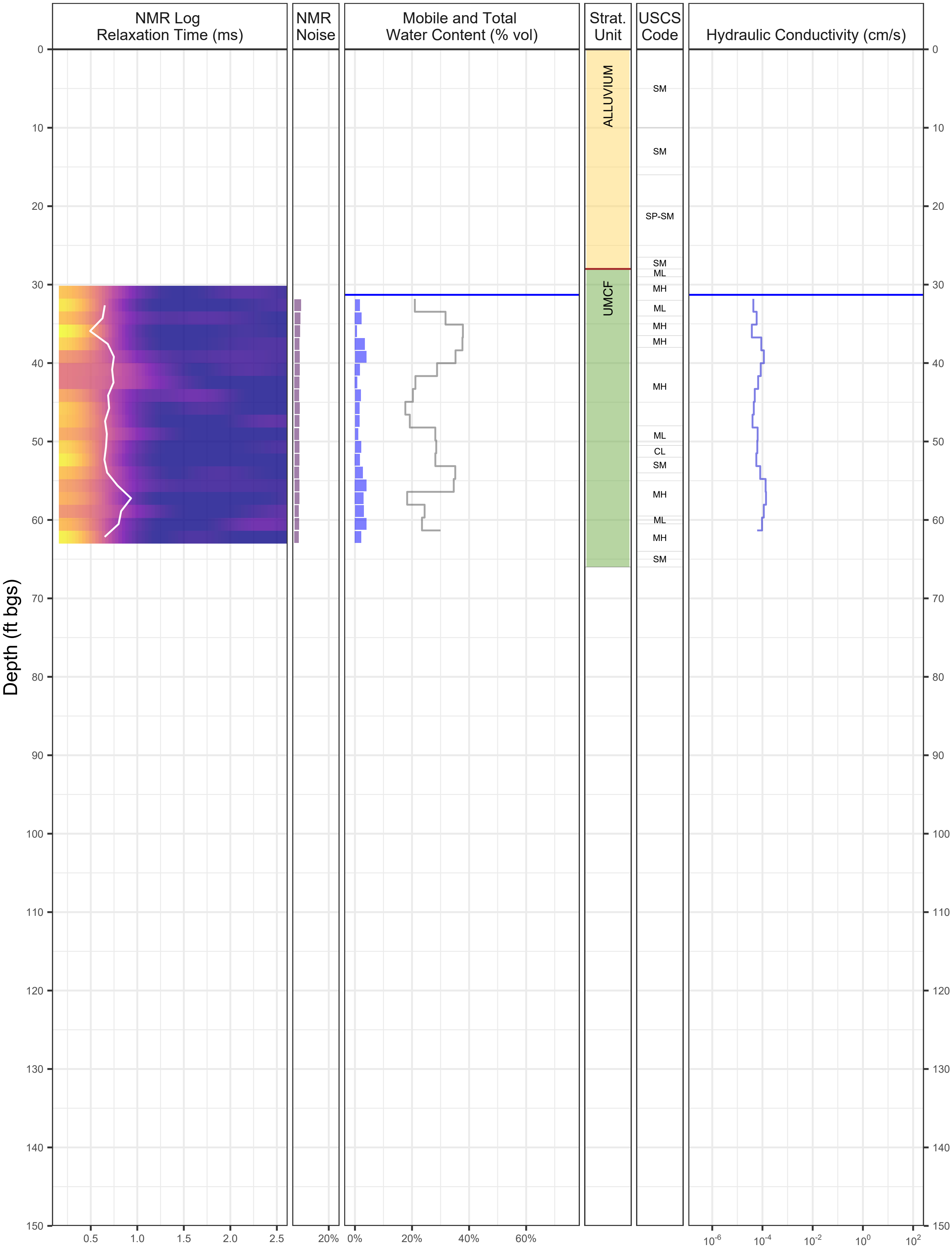
OU-2: ES-39



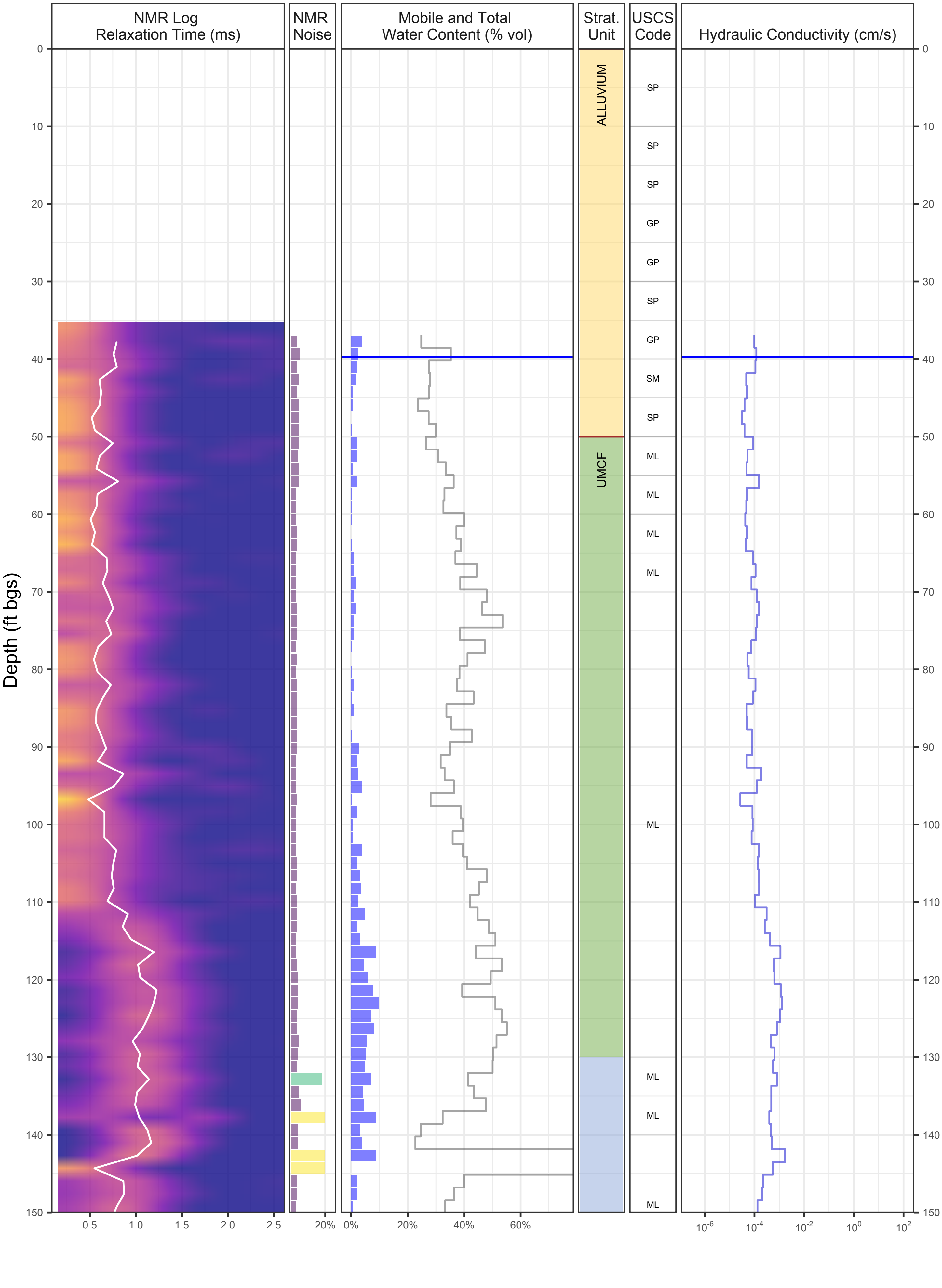
NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SM
SW-SM
SW
MH
ML
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}


OU-2: M-152
NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
GP
SW
ML
ML
SM
ML
ML
SM
ML
SM
ML
CL
SM
ML
CL
ML
K=2.1e-05 cm/s

OU-2: MC-MW-37R2

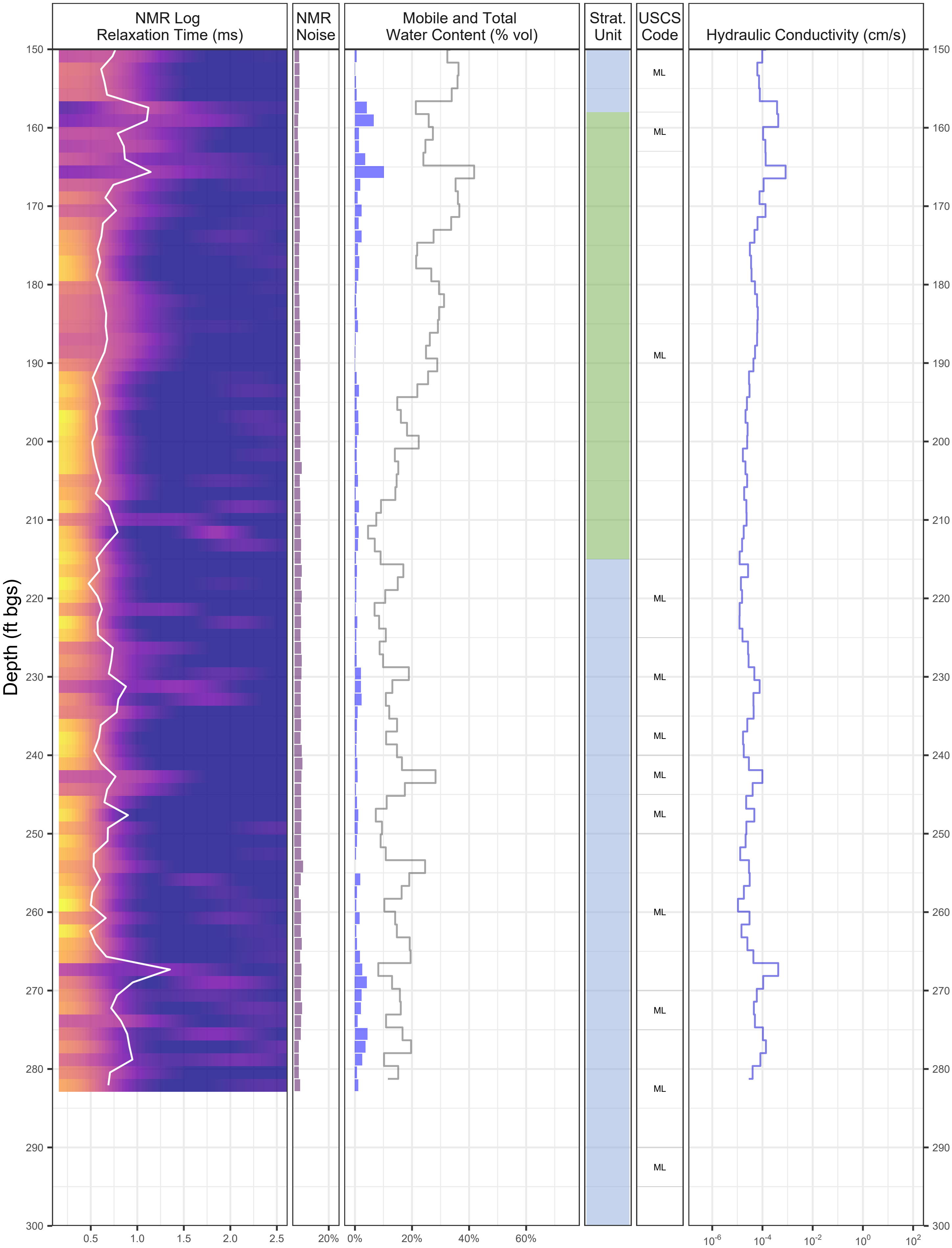


OU-2: MCF-09A

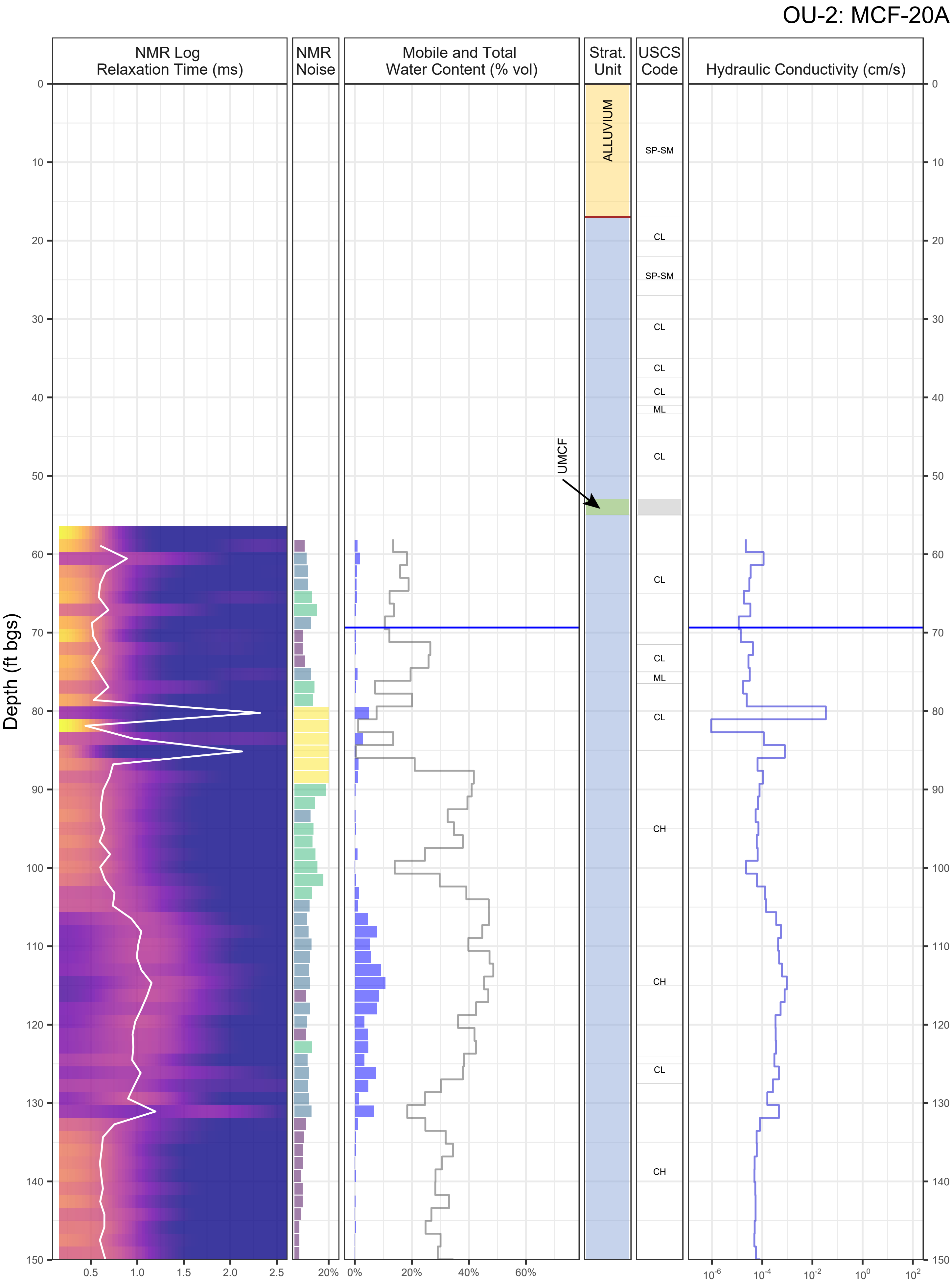


NMR Log Relaxation Time (ms)
NMR Noise
Mobile and Total Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
ALLUVIUM
UMCF
SP
SP
SP
GP
GP
SP
GP
SM
SP
ML
ML
ML
ML
ML
ML
ML
ML
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}

OU-2: MCF-09A

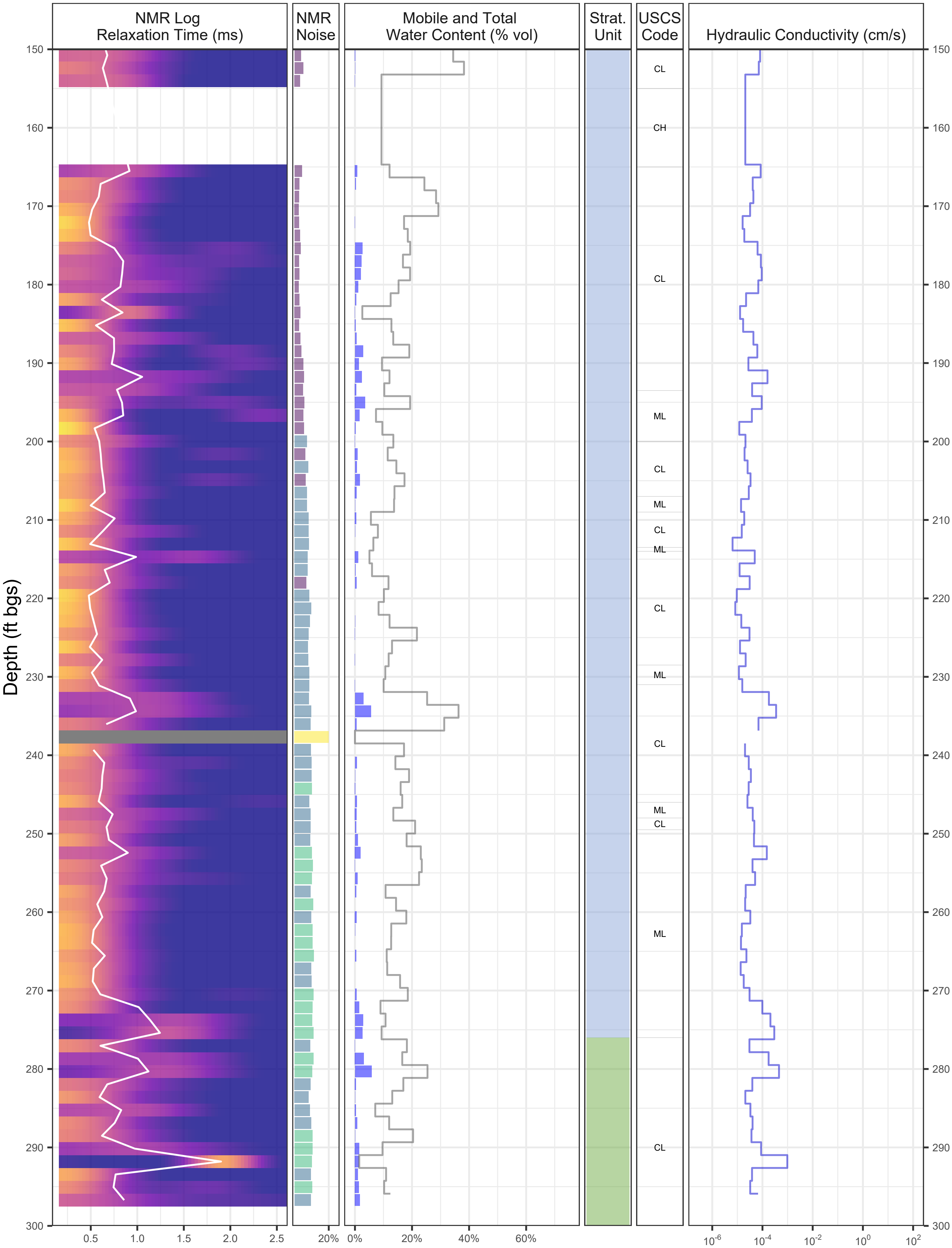


NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
150
160
170
180
190
200
210
220
230
240
250
260
270
280
290
300
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
ML
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}



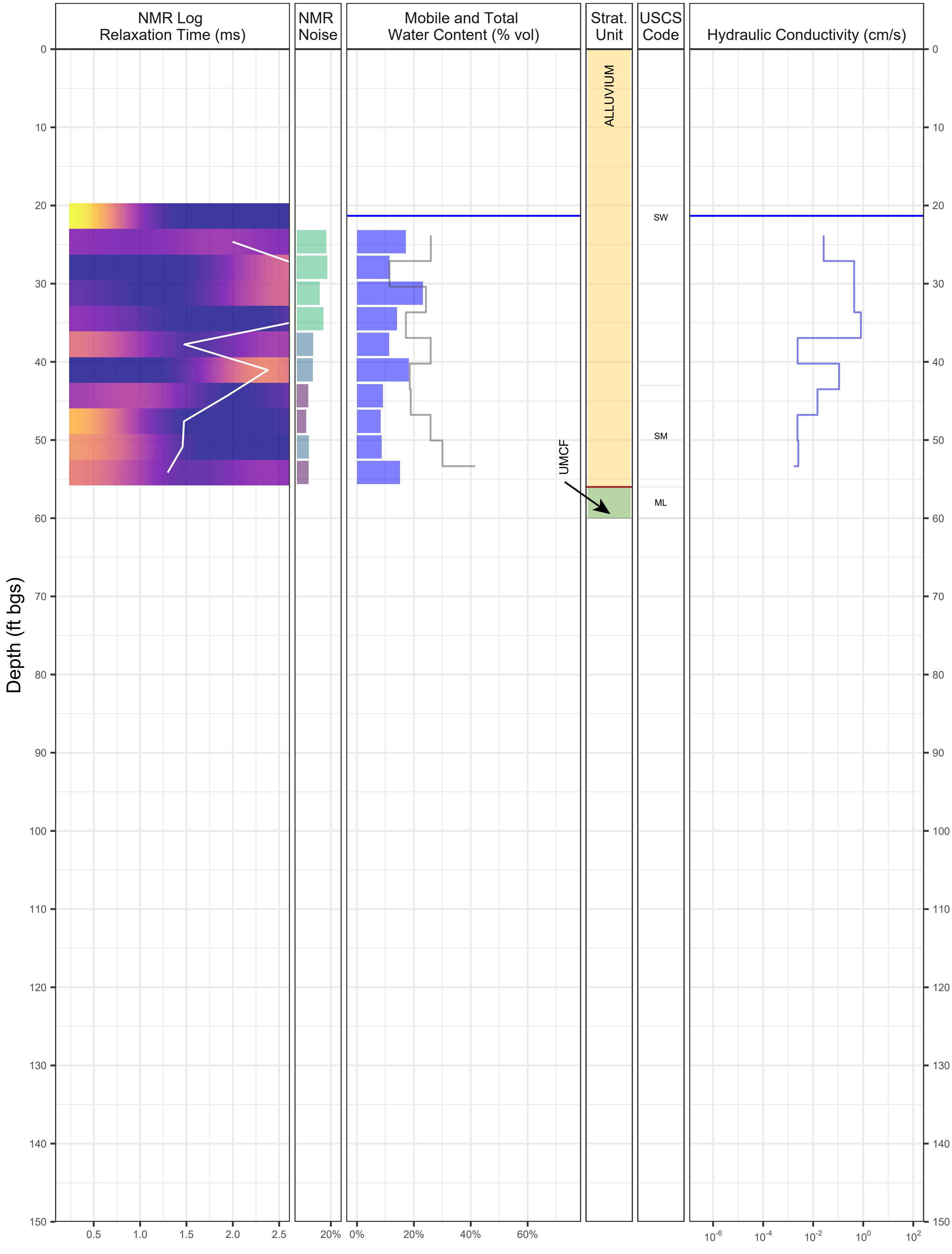
OU-2: MCF-20A
NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SP-SM
CL
SP-SM
CL
CL
CL
ML
CL
CL
CL
ML
CL
CH
CH
CL
CH
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}

OU-2: MCF-20A



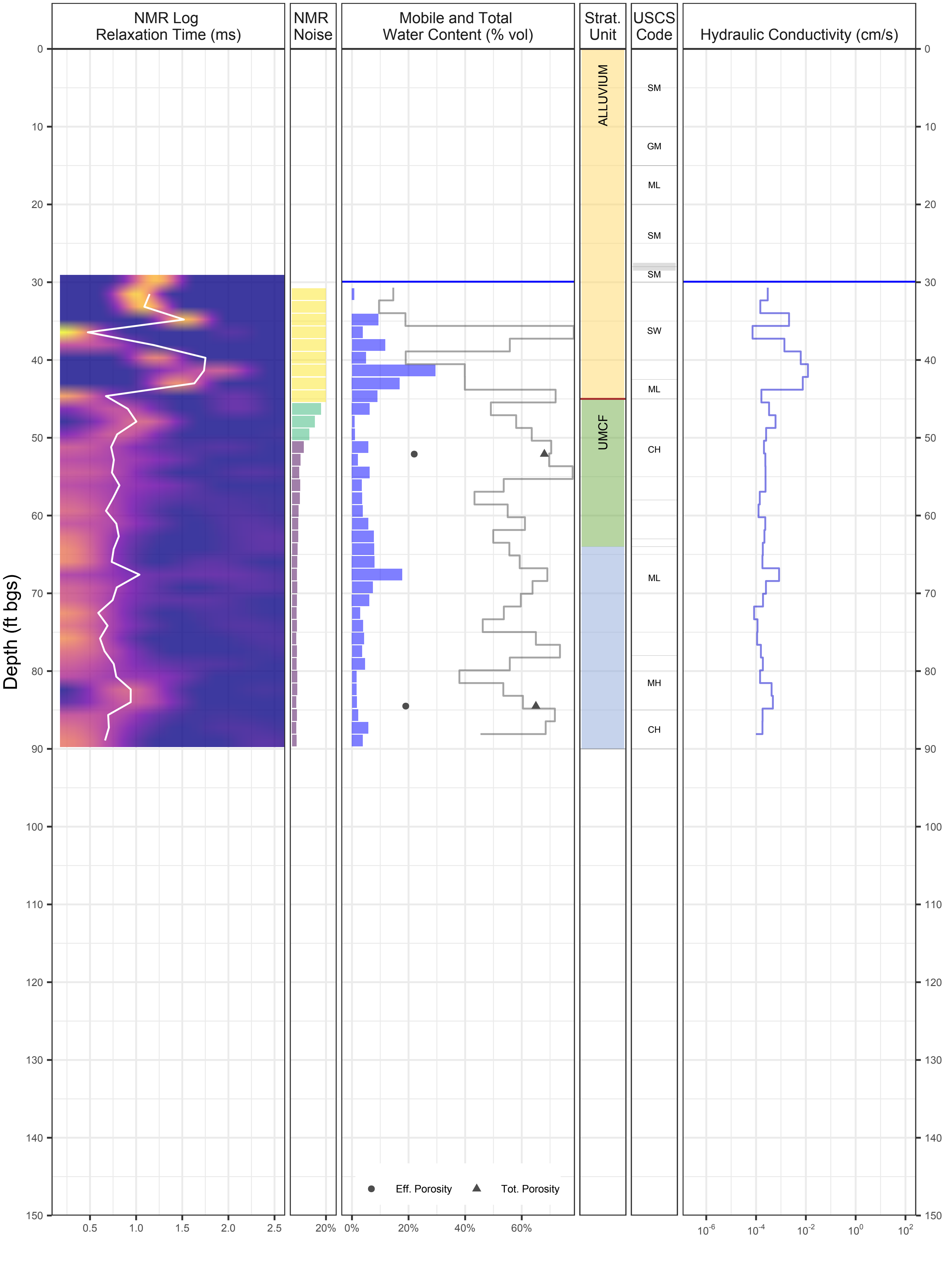
NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
150
160
170
180
190
200
210
220
230
240
250
260
270
280
290
300
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
CL
CH
CL
ML
CL
ML
CL
ML
CL
ML
CL
ML
CL
ML
CL

OU-2: PC-40R



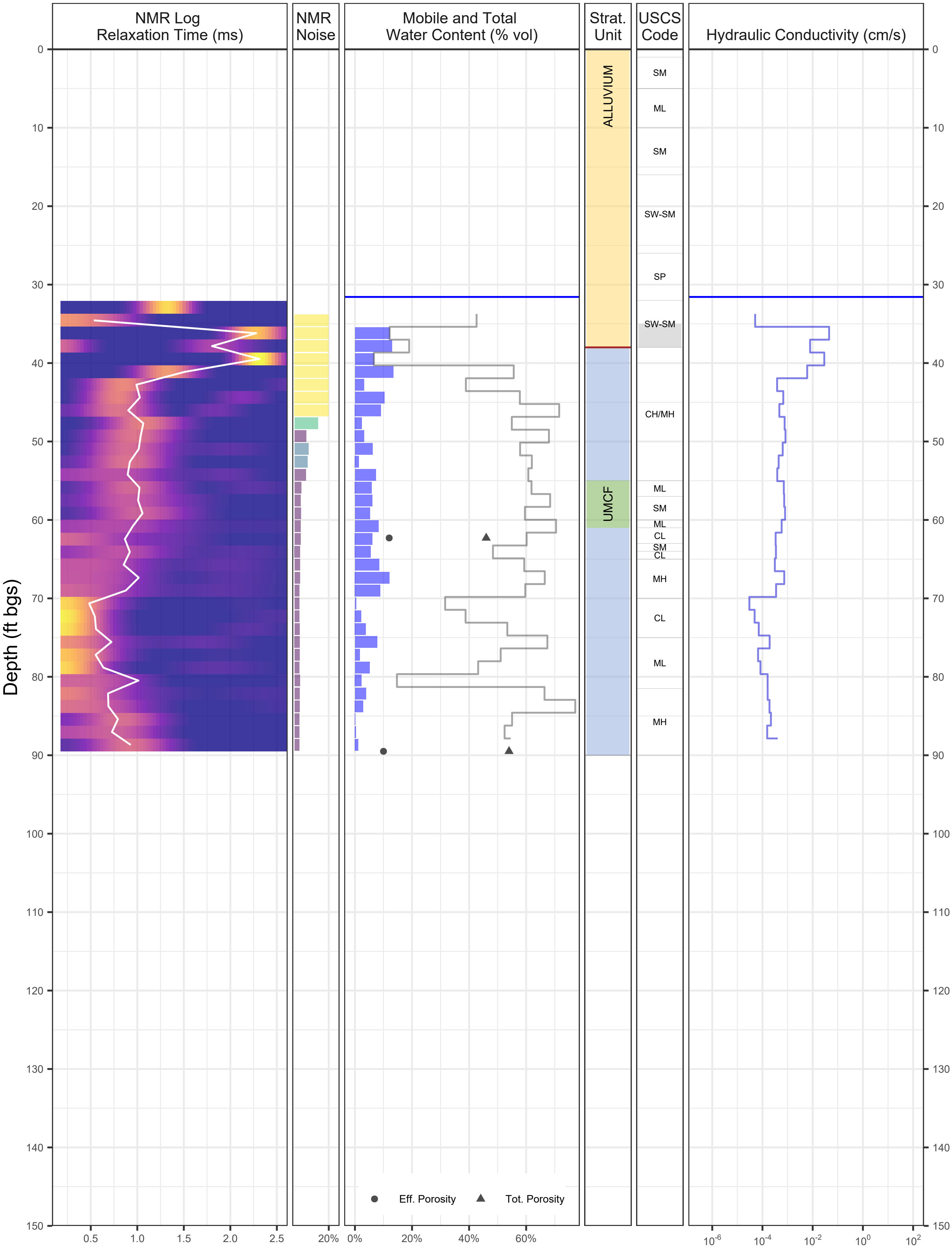
NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}
ALLUVIUM
UMCF
SW
SM
ML

OU-2: PC-134D

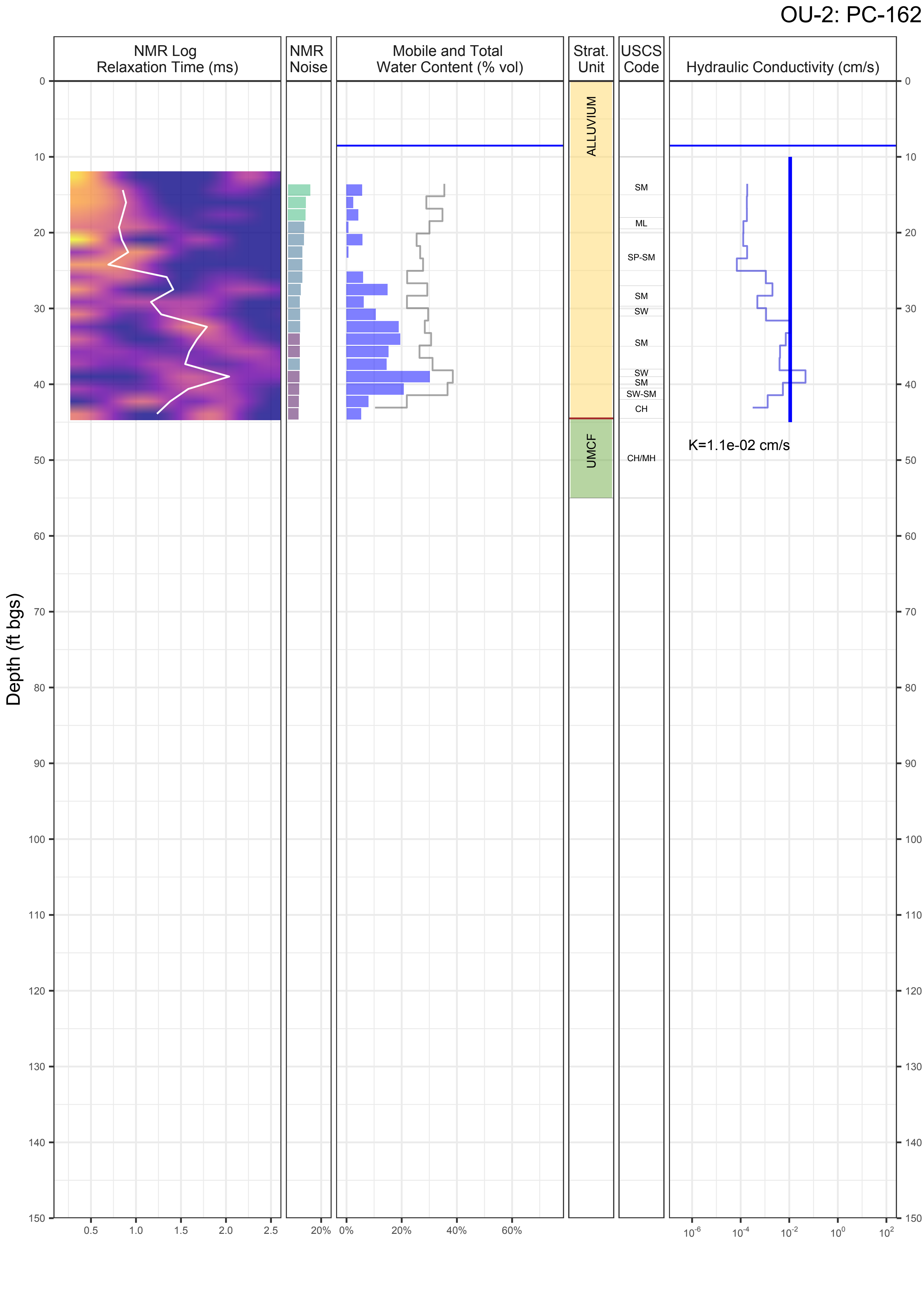


NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SM
GM
ML
SM
SM
SW
ML
CH
ML
MH
CH
Eff. Porosity
Tot. Porosity
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150

OU-2: PC-137D

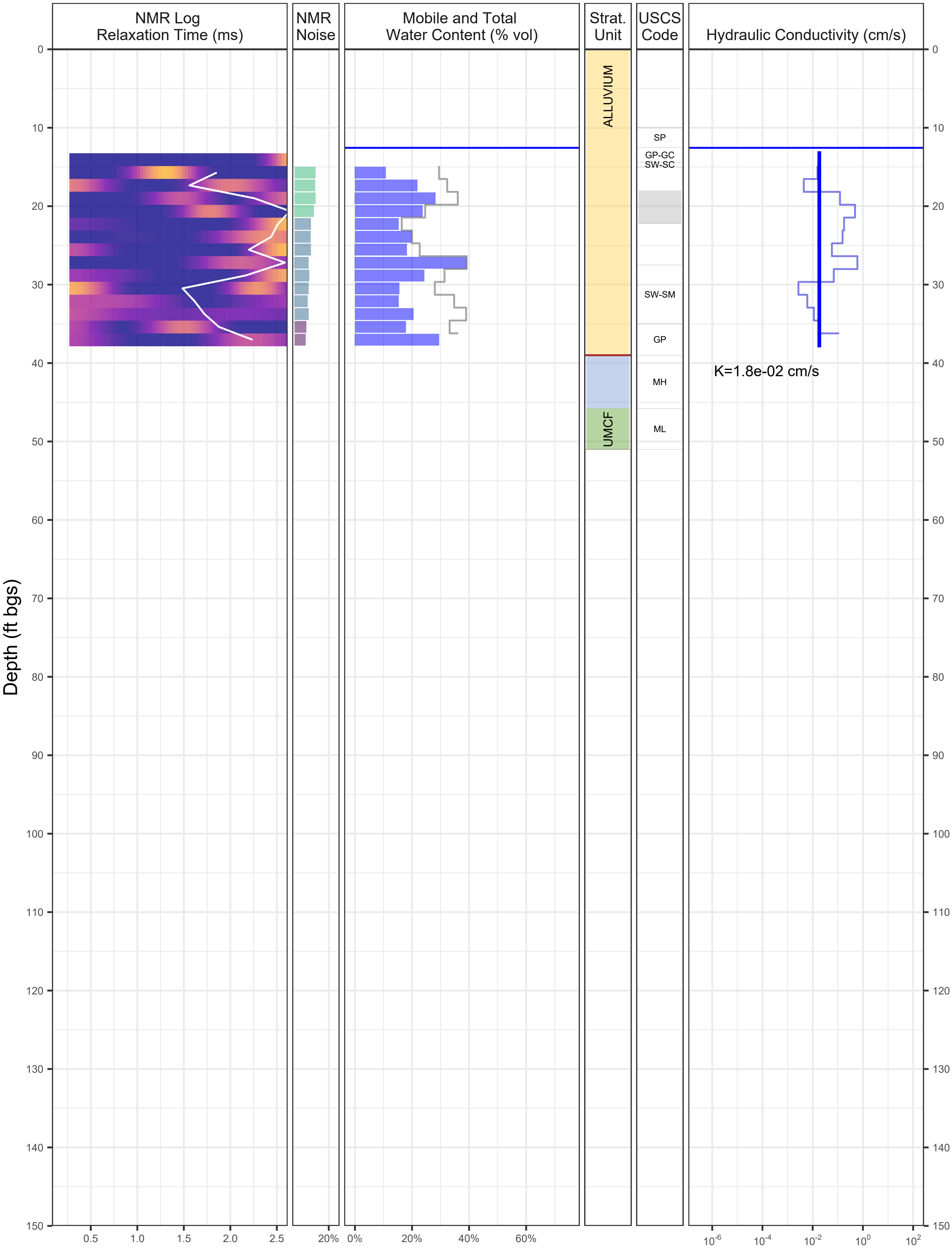


NMR Log
Relaxation Time (ms)
NMR
Noise
Mobile and Total
Water Content (% vol)
Strat.
Unit
USCS
Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SM
ML
SM
SW-SM
SP
SW-SM
CH/MH
ML
SM
ML
CL
SM
CL
MH
CL
ML
MH
Eff. Porosity
Tot. Porosity
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}



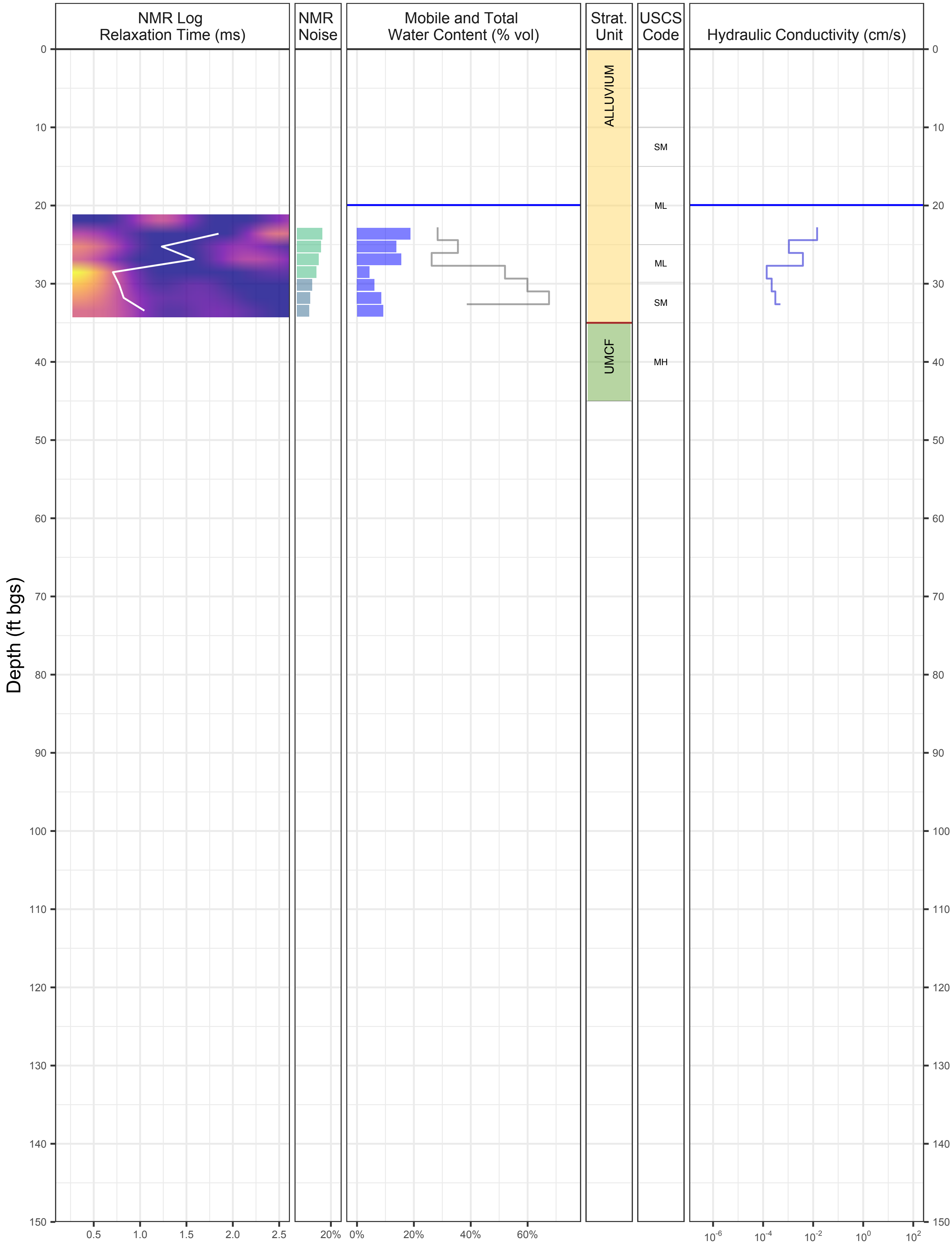
OU-2: PC-162
NMR Log
Relaxation Time (ms)
NMR
Noise
Mobile and Total
Water Content (% vol)
Strat.
Unit
USCS
Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SM
ML
SP-SM
SM
SW
SM
SW
SM
SW-SM
CH
CH/MH
K=1.1e-02 cm/s
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}

OU-2: PC-165

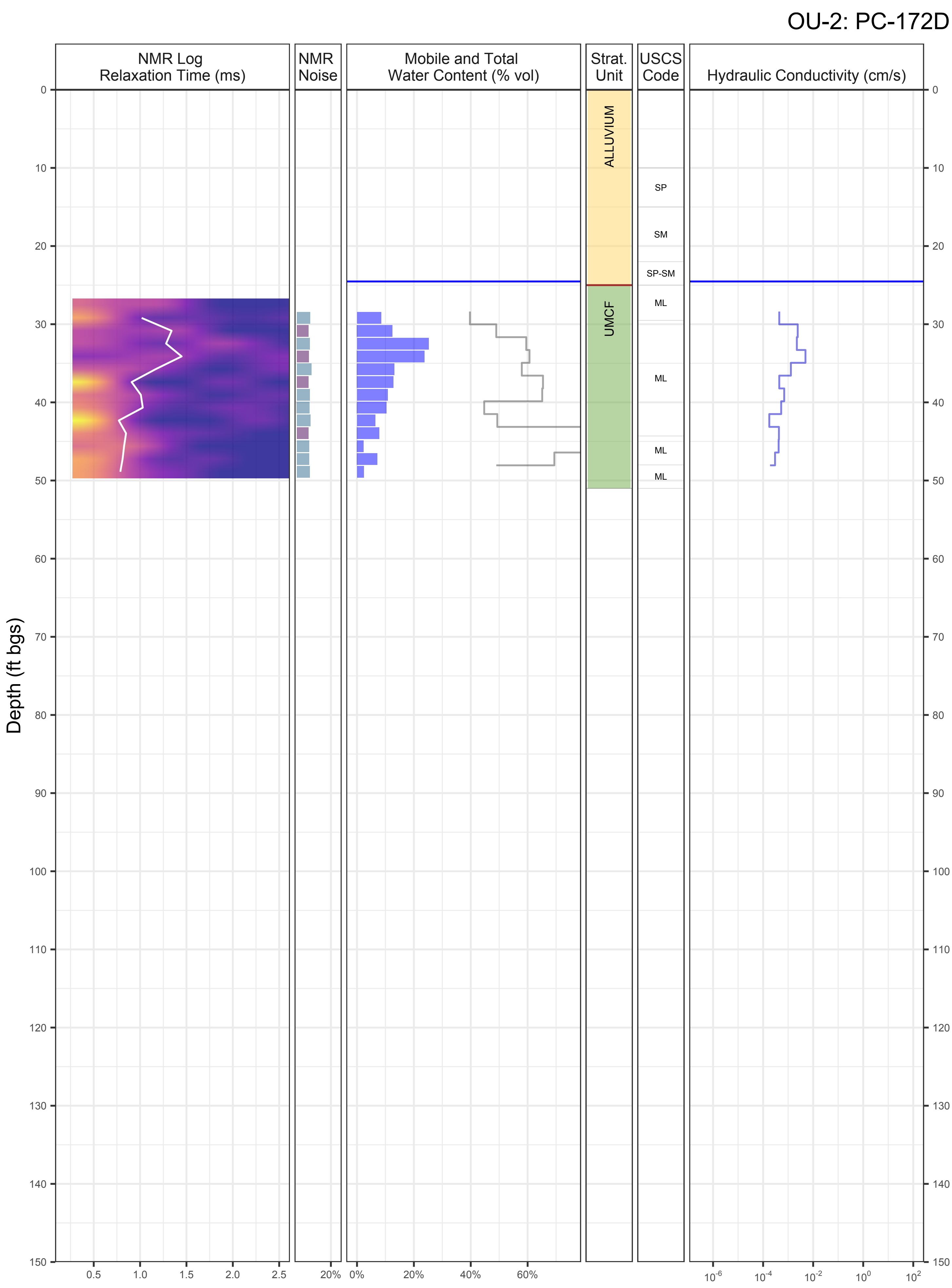


NMR Log
Relaxation Time (ms)
NMR
Noise
Mobile and Total
Water Content (% vol)
Strat.
Unit
USCS
Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SP
GP-GC
SW-SC
SW-SM
GP
MH
ML
K=1.8e-02 cm/s
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}

OU-2: PC-168

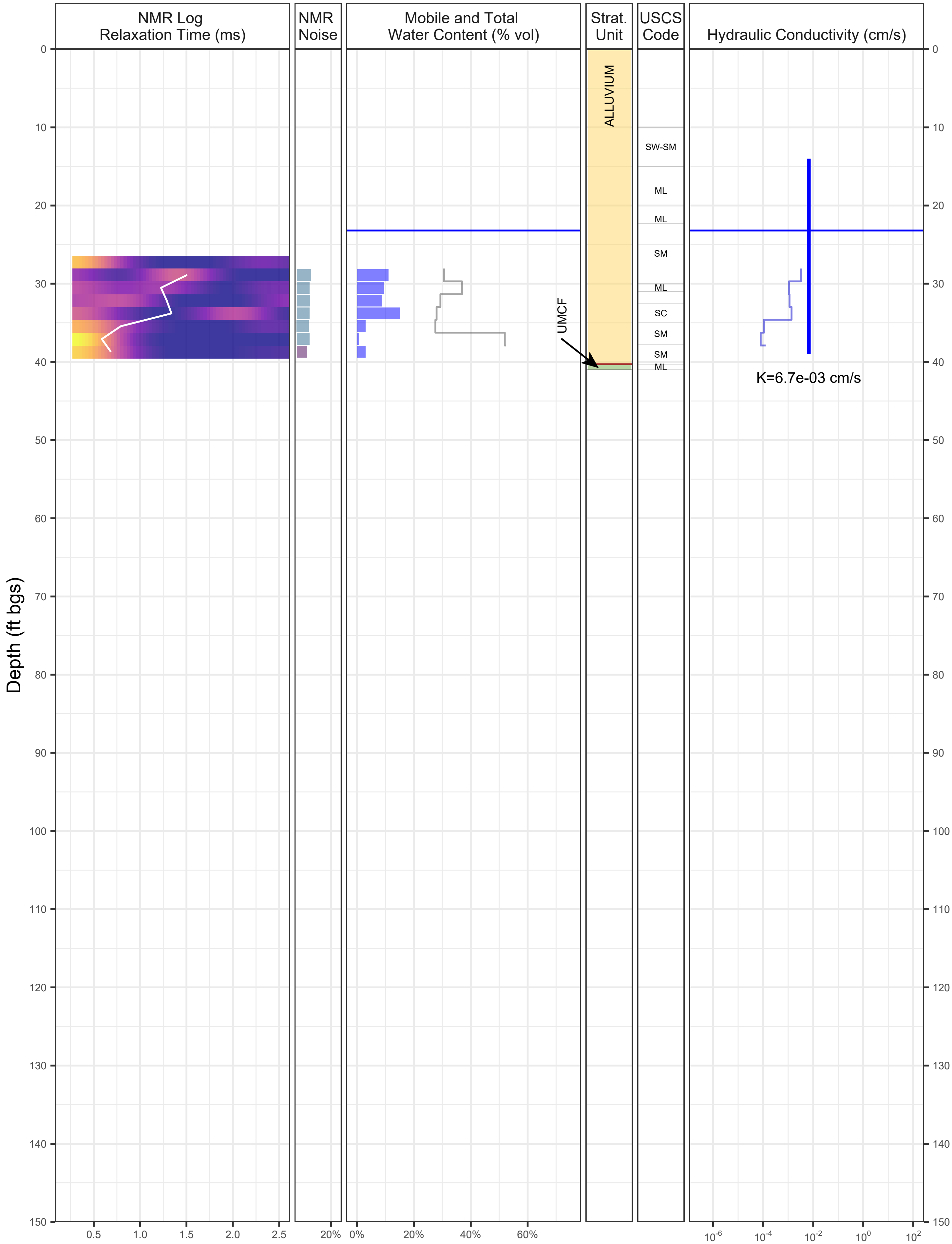


NMR Log
Relaxation Time (ms)
NMR
Noise
Mobile and Total
Water Content (% vol)
Strat.
Unit
USCS
Code
Hydraulic Conductivity (cm/s)
ALLUVIUM
UMCF
SM
ML
ML
SM
MH
Depth (ft bgs)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}

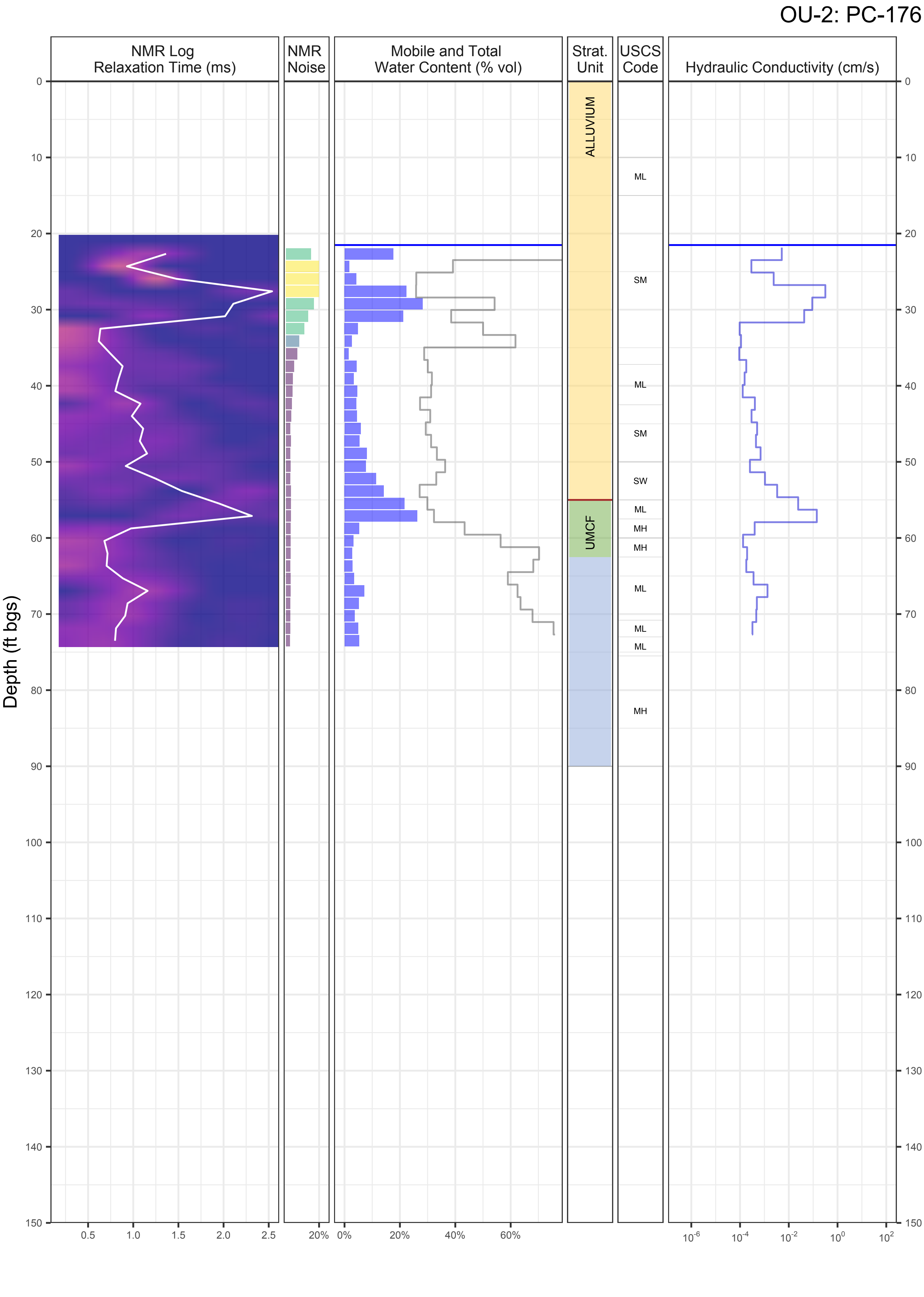


OU-2: PC-172D
NMR Log
Relaxation Time (ms)
NMR
Noise
Mobile and Total
Water Content (% vol)
Strat.
Unit
USCS
Code
Hydraulic Conductivity (cm/s)
ALLUVIUM
UMCF
SP
SM
SP-SM
ML
ML
ML
ML
Depth (ft bgs)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}

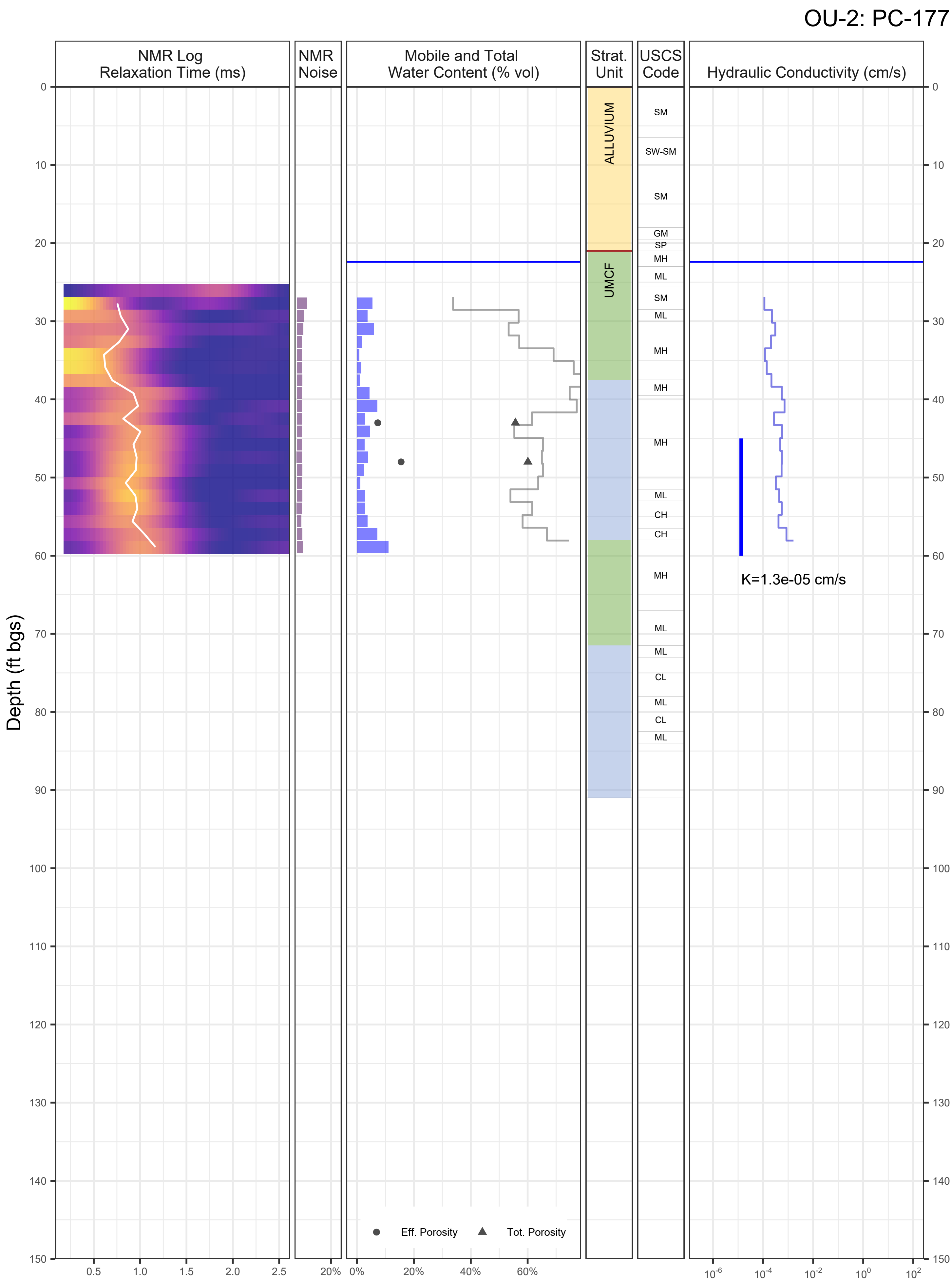
OU-2: PC-175



NMR Log
Relaxation Time (ms)
NMR
Noise
Mobile and Total
Water Content (% vol)
Strat.
Unit
USCS
Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SW-SM
ML
ML
SM
ML
SC
SM
SM
ML
K=6.7e-03 cm/s
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150

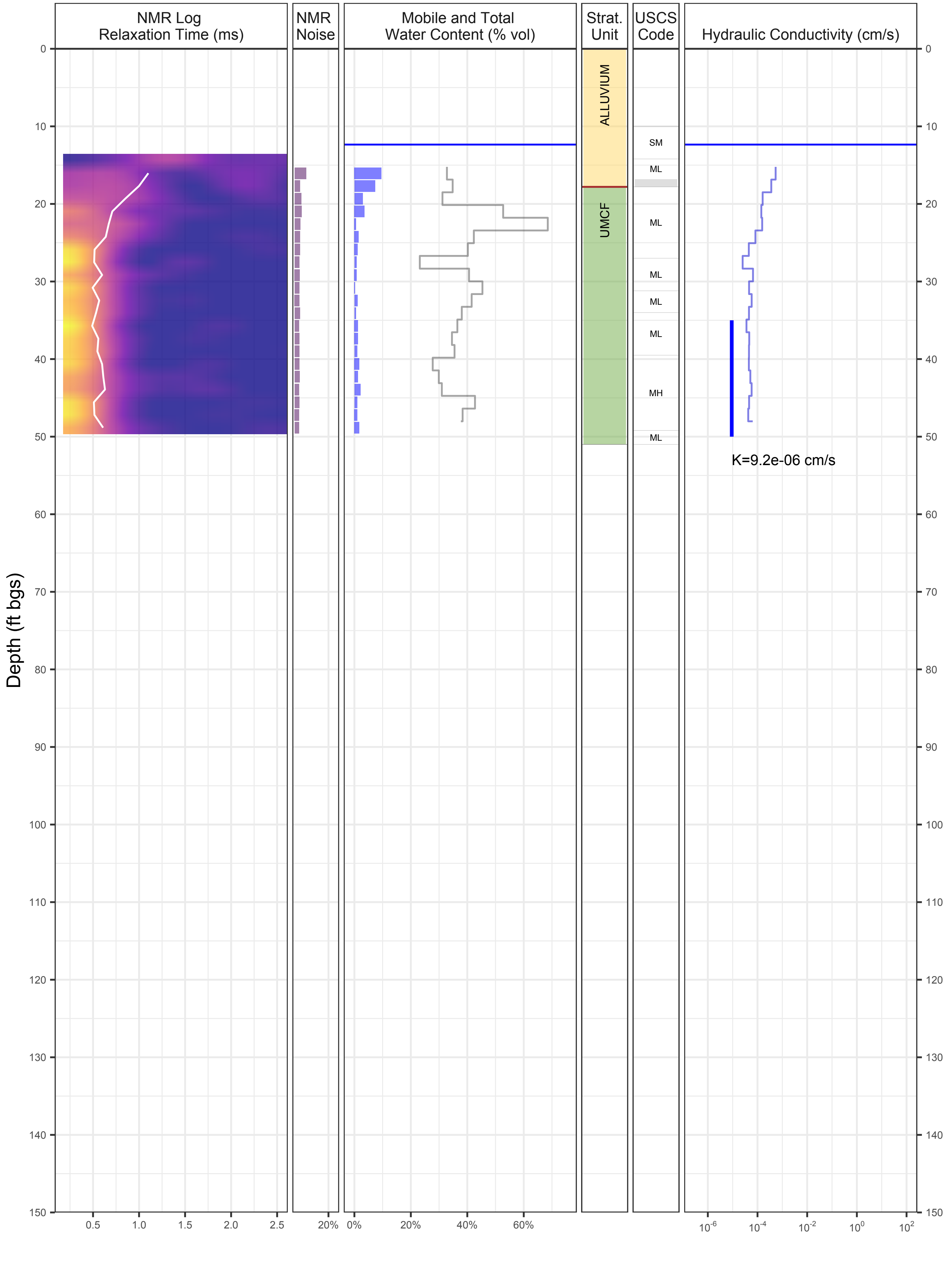


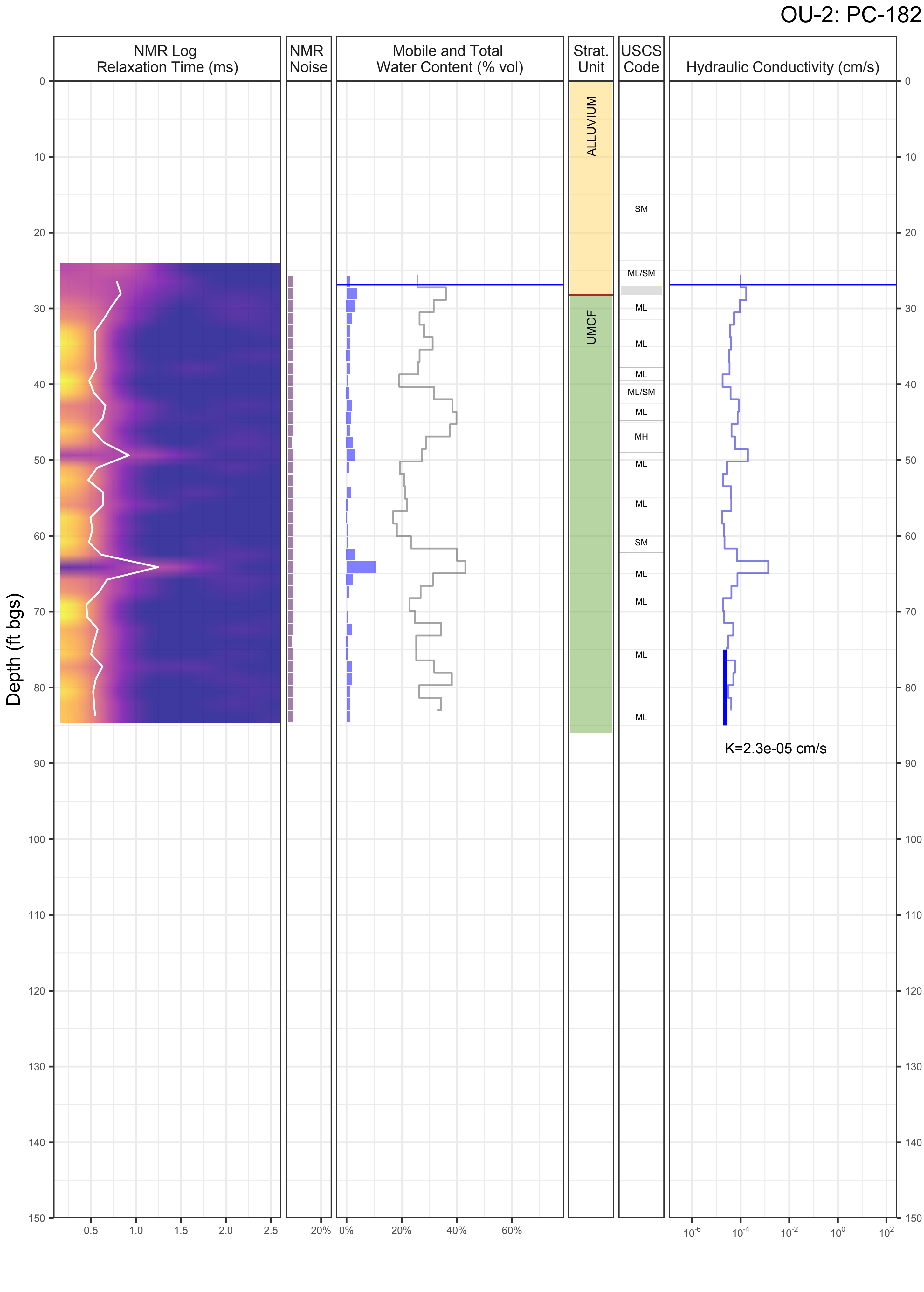
OU-2: PC-176
NMR Log Relaxation Time (ms)
NMR Noise
Mobile and Total Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
ML
SM
ML
SM
SW
ML
MH
MH
ML
ML
ML
MH
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150



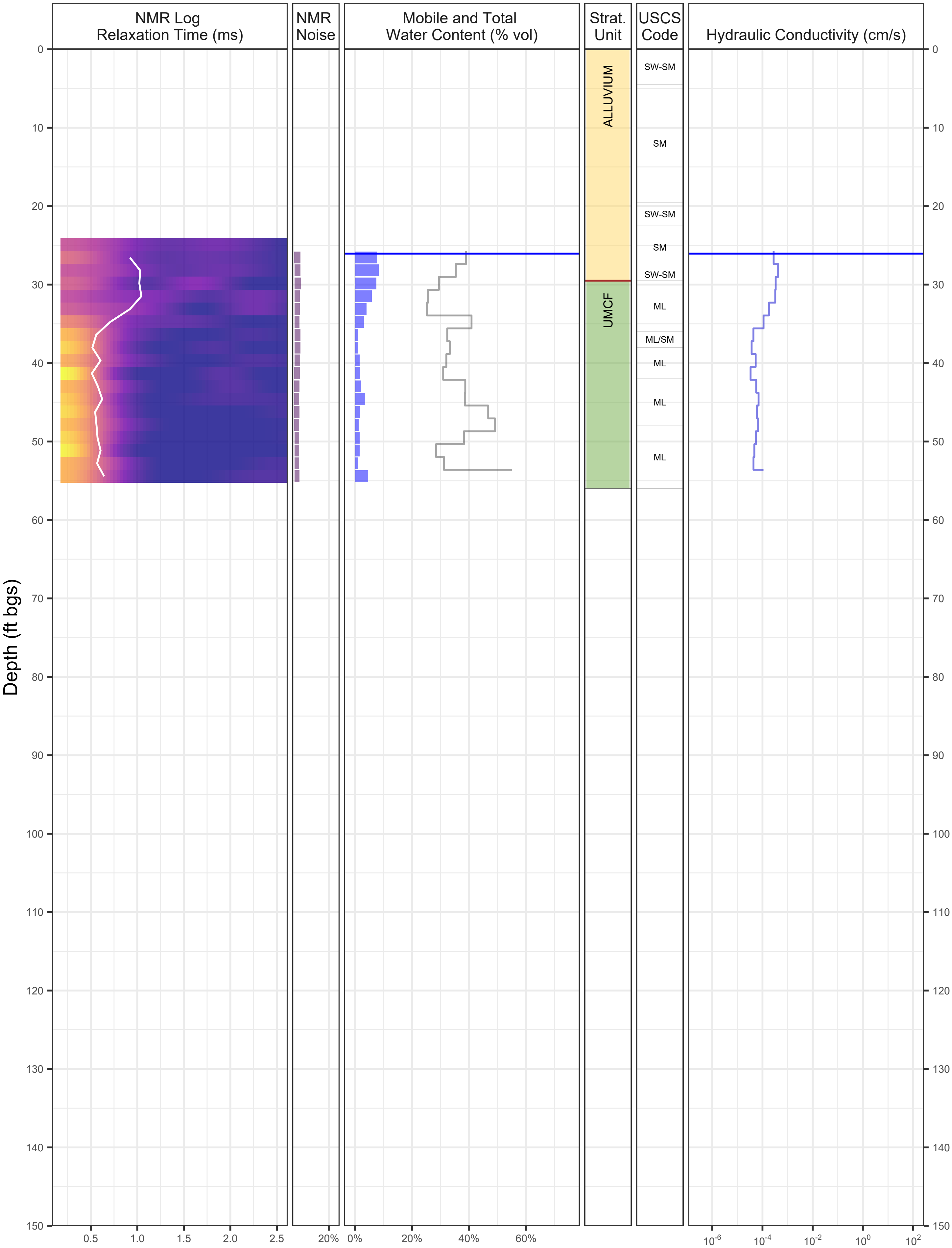
OU-2: PC-177
NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SM
SW-SM
SM
GM
SP
MH
ML
SM
ML
MH
MH
MH
ML
CH
CH
MH
ML
ML
CL
ML
CL
ML
K=1.3e-05 cm/s
Eff. Porosity
Tot. Porosity

OU-2: PC-179

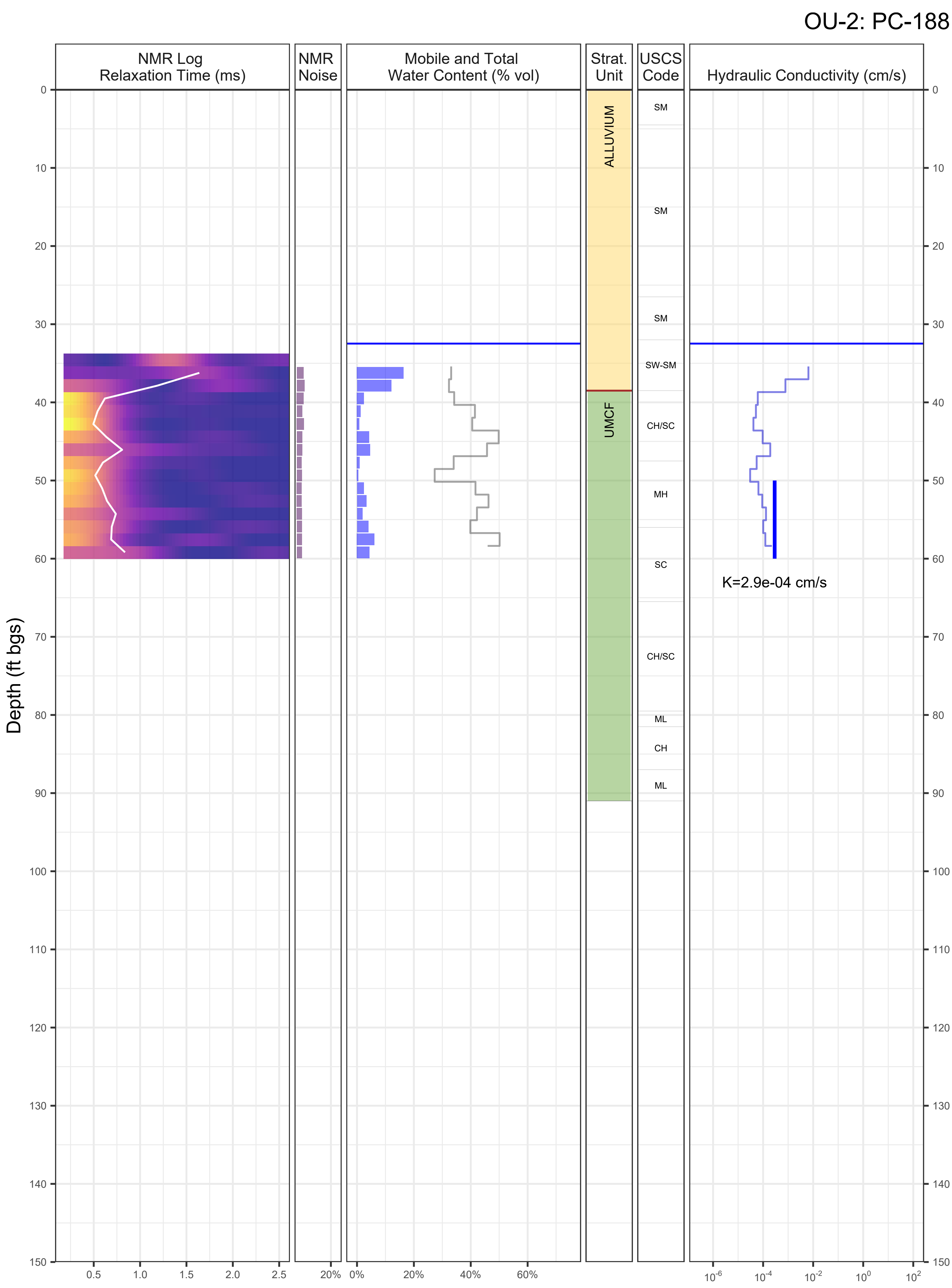

NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SM
ML
ML
ML
ML
ML
MH
ML
K=9.2e-06 cm/s

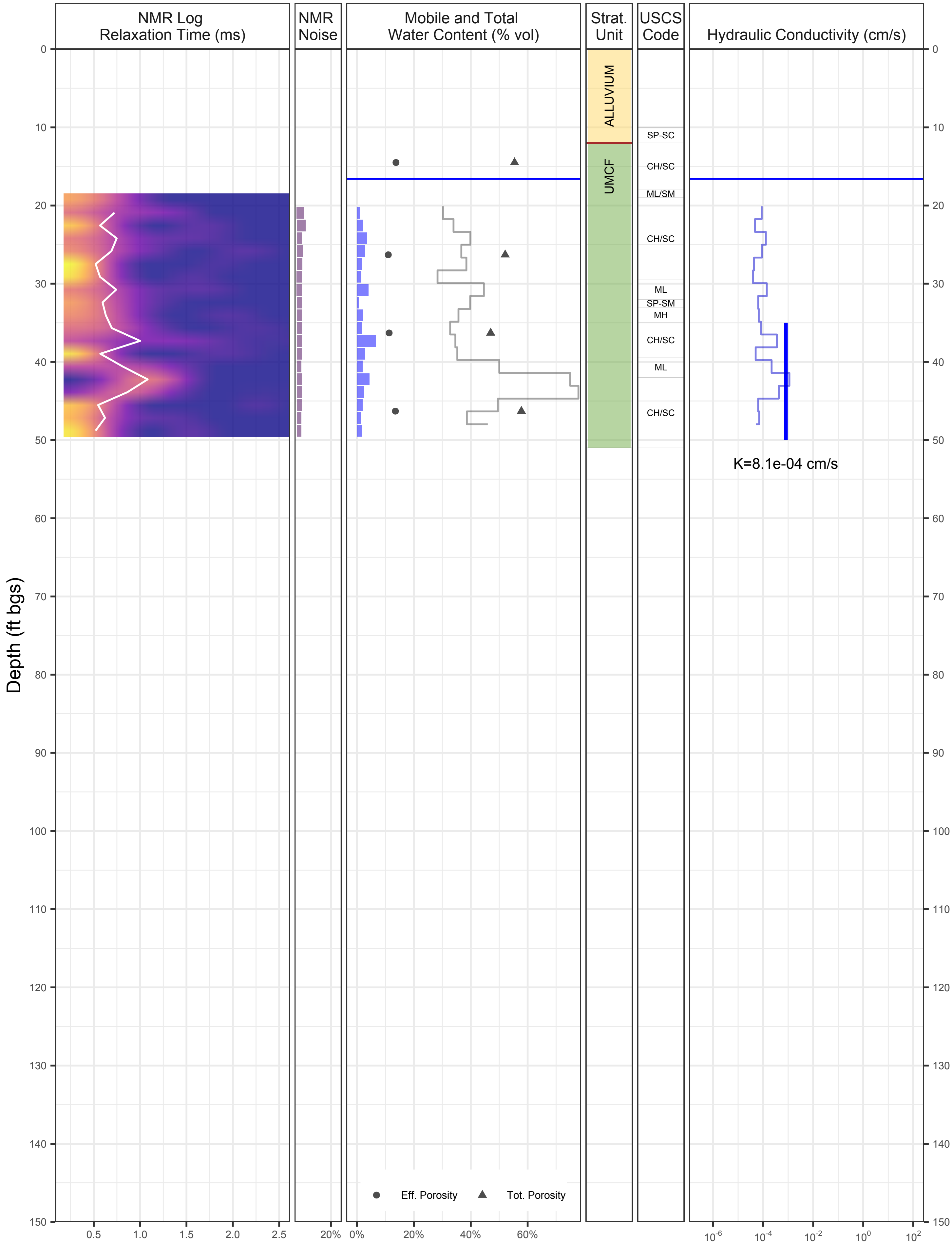

OU-2: PC-182
NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SM
ML/SM
ML
ML
ML
ML/SM
ML
MH
ML
ML
SM
ML
ML
ML
ML
K=2.3e-05 cm/s
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}

OU-2: PC-187R

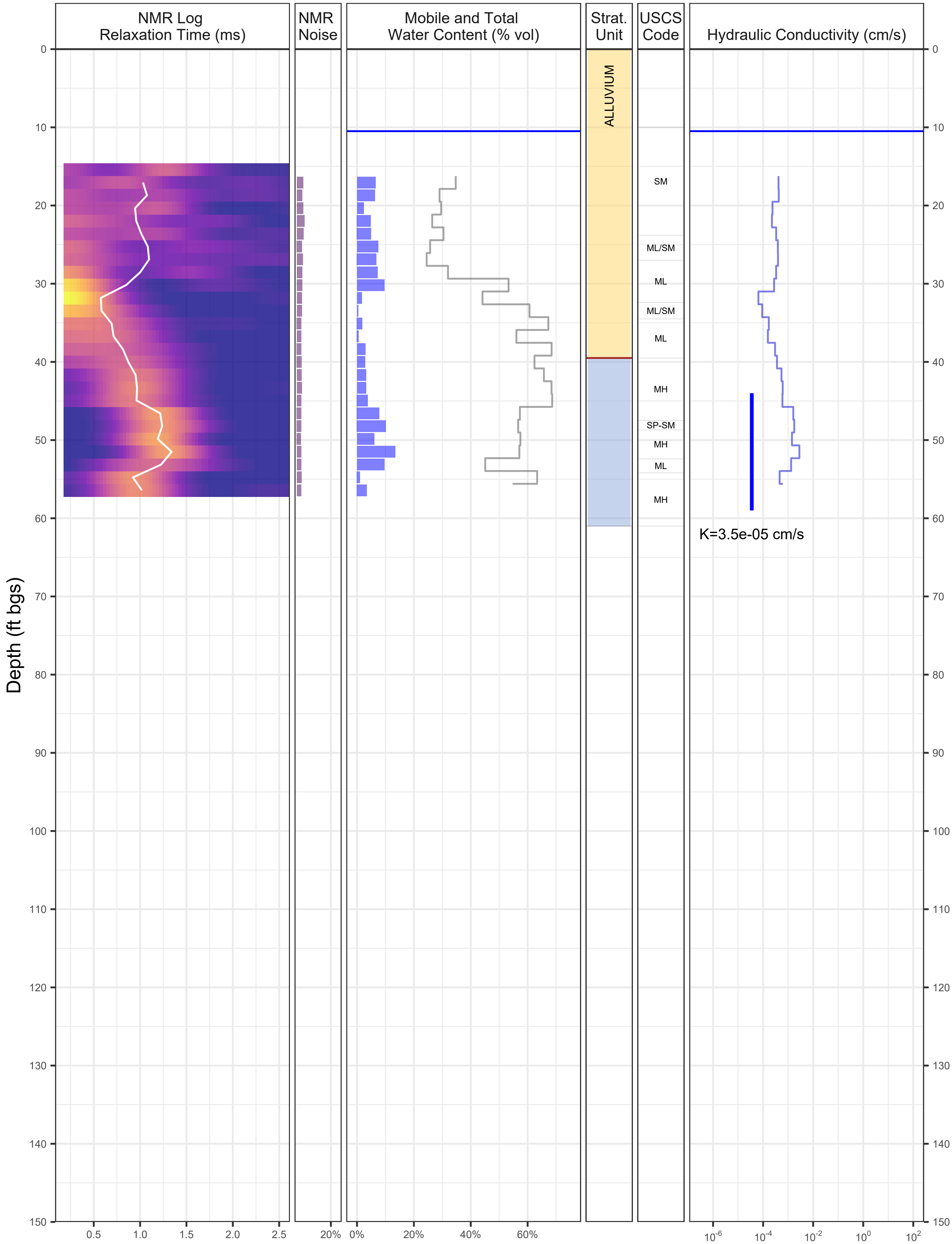


NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
ALLUVIUM
UMCF
SW-SM
SM
SW-SM
SM
SW-SM
ML
ML/SM
ML
ML
ML
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}


OU-2: PC-188
NMR Log Relaxation Time (ms)
NMR Noise
Mobile and Total Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SM
SM
SM
SW-SM
CH/SC
MH
SC
CH/SC
ML
CH
ML
K=2.9e-04 cm/s
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}

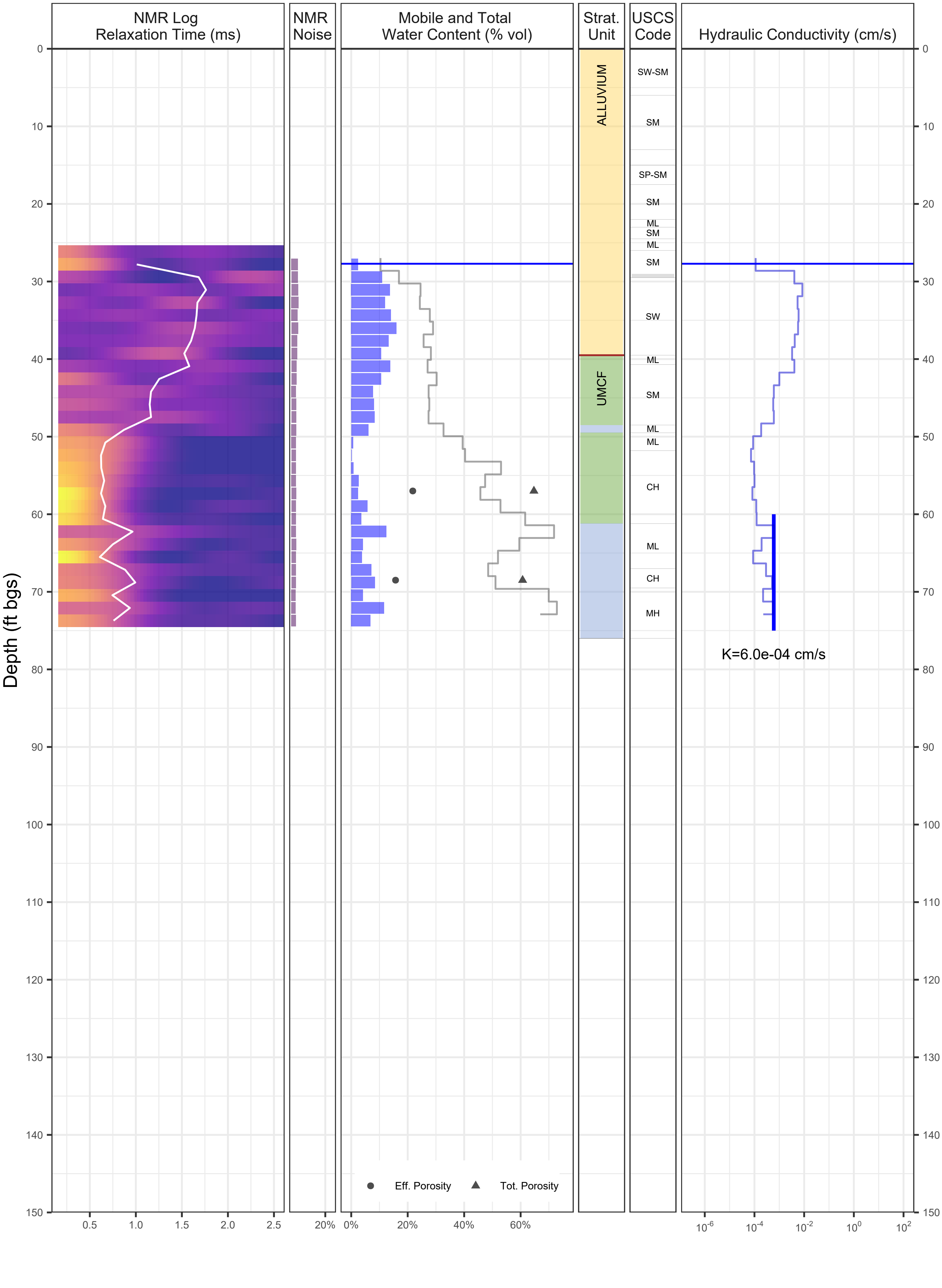

NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total
Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SP-SC
CH/SC
ML/SM
CH/SC
ML
SP-SM
MH
CH/SC
ML
CH/SC
K=8.1e-04 cm/s
Eff. Porosity
Tot. Porosity
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}

OU-2: PC-194



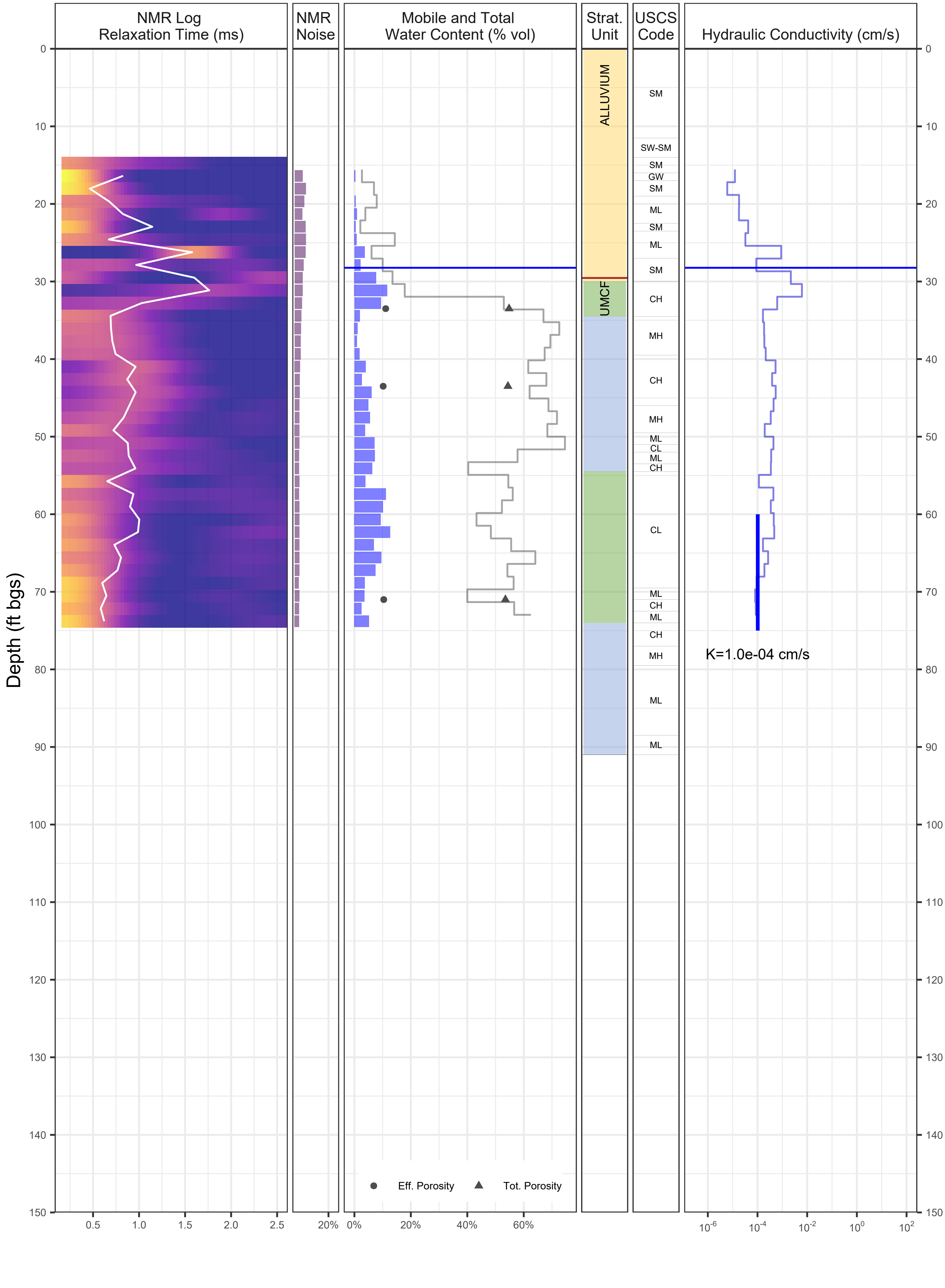
NMR Log
Relaxation Time (ms)
NMR
Noise
Mobile and Total
Water Content (% vol)
Strat.
Unit
USCS
Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
SM
ML/SM
ML
ML/SM
ML
MH
SP-SM
MH
ML
MH
K=3.5e-05 cm/s
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}

OU-2: PC-195

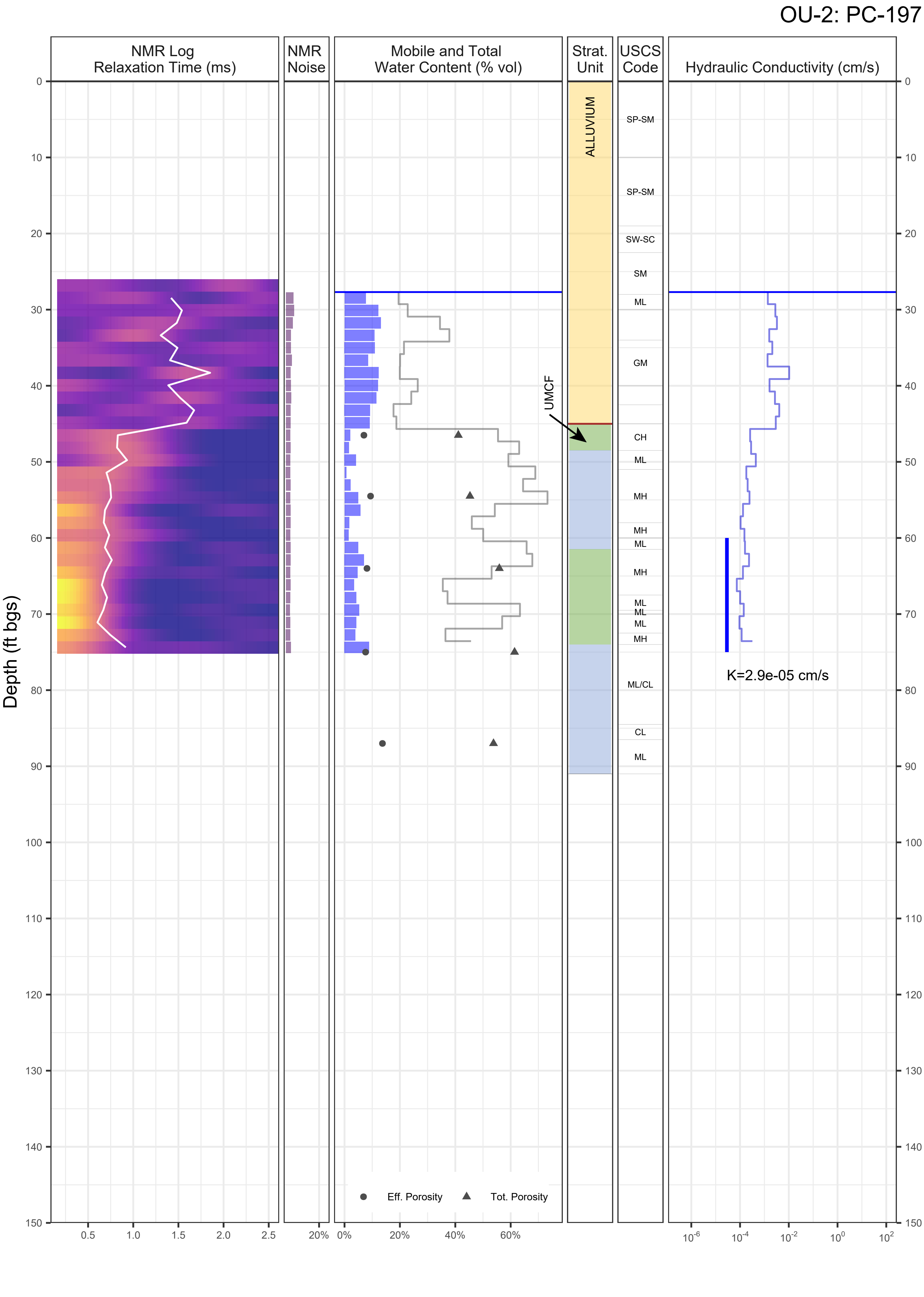


NMR Log
Relaxation Time (ms)
NMR Noise
Mobile and Total Water Content (% vol)
Strat. Unit
USCS Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SW-SM
SM
SP-SM
SM
ML
SM
ML
SM
SW
ML
SM
ML
ML
CH
ML
CH
MH
K=6.0e-04 cm/s
Eff. Porosity
Tot. Porosity
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}

OU-2: PC-196



NMR Log
Relaxation Time (ms)
NMR
Noise
Mobile and Total
Water Content (% vol)
Strat.
Unit
USCS
Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SM
SW-SM
SM
GW
SM
ML
SM
ML
SM
CH
MH
CH
MH
ML
CL
ML
CH
CL
ML
CH
ML
CH
MH
ML
ML
K=1.0e-04 cm/s
Eff. Porosity
Tot. Porosity
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150



OU-2: PC-197
NMR Log
Relaxation Time (ms)
NMR
Noise
Mobile and Total
Water Content (% vol)
Strat.
Unit
USCS
Code
Hydraulic Conductivity (cm/s)
Depth (ft bgs)
ALLUVIUM
UMCF
SP-SM
SP-SM
SW-SC
SM
ML
GM
CH
ML
MH
MH
ML
MH
ML
ML
ML
MH
ML/CL
CL
ML
K=2.9e-05 cm/s
Eff. Porosity
Tot. Porosity
0.5
1.0
1.5
2.0
2.5
20%
0%
20%
40%
60%
10^{-6}
10^{-4}
10^{-2}
10^{0}
10^{2}
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150