



Standard Test Method for (Analytical Procedure) Determining Transmissivity of Confined Nonleaky Aquifers by Critically Damped Well Response to Instantaneous Change in Head (Slug)¹

This standard is issued under the fixed designation D5881; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope*

1.1 This test method covers determination of transmissivity from the measurement of water-level response to a sudden change of water level in a well-aquifer system characterized as being critically damped or in the transition range from underdamped to overdamped. Underdamped response is characterized by oscillatory changes in water level; overdamped response is characterized by return of the water level to the initial static level in an approximately exponential manner. Overdamped response is covered in Guide [D4043](#); underdamped response is covered in [D5785](#), [D4043](#).

1.2 The analytical procedure in this test method is used in conjunction with Guide [D4043](#) and the field procedure in Test Method [D4044](#) for collection of test data.

1.3 *Limitations*—Slug tests are considered to provide an estimate of the transmissivity of an aquifer near the well screen. The method is applicable for systems in which the damping parameter, ζ , is within the range from 0.2 through 5.0. The assumptions of the method prescribe a fully penetrating well (a well open through the full thickness of the aquifer) in a confined, nonleaky aquifer.

1.4 All observed and calculated values shall conform to the guidelines for significant digits and rounding established in Practice [D6026](#).

1.5 *Units*—The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.5.1 The procedures used to specify how data are collected/recorded or calculated, in this standard are regarded as the industry standard. In addition, they are representative of the significant digits that generally should be retained. The procedures used do not consider material variation, purpose for obtaining the data, special purpose studies, or any consider-

ations for the user's objectives and it is common practice to increase to reduce significant digits of reported data to be commensurate with these considerations. It is beyond the scope of this standard to consider significant digits used in analytical methods for design.

1.6 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:²

- [D653 Terminology Relating to Soil, Rock, and Contained Fluids](#)
- [D3740 Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction](#)
- [D4043 Guide for Selection of Aquifer Test Method in Determining Hydraulic Properties by Well Techniques](#)
- [D4044 Test Method for \(Field Procedure\) for Instantaneous Change in Head \(Slug\) Tests for Determining Hydraulic Properties of Aquifers](#)
- [D5785 Test Method for \(Analytical Procedure\) for Determining Transmissivity of Confined Nonleaky Aquifers by Underdamped Well Response to Instantaneous Change in Head \(Slug Test\)](#)
- [D6026 Practice for Using Significant Digits in Geotechnical Data](#)

3. Terminology

3.1 *Definitions*—For definitions of common technical terms in this standard, refer to Terminology [D653](#).

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *aquifer, confined*—an aquifer bounded above and below by confining beds and in which the static head is above the top of the aquifer.

¹ This test method is under the jurisdiction of ASTM Committee [D18](#) on Soil and Rock and is the direct responsibility of Subcommittee [D18.21](#) on Groundwater and Vadose Zone Investigations.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.