



Standard Guide for Conducting a Sensitivity Analysis for a Groundwater Flow Model Application¹

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1. Scope

1.1 This guide covers techniques that should be used to conduct a sensitivity analysis for a groundwater flow model. The sensitivity analysis results in quantitative relationships between model results and the input hydraulic properties or boundary conditions of the aquifers.

1.2 After a groundwater flow model has been calibrated, a sensitivity analysis may be performed. Examination of the sensitivity of calibration residuals and model conclusions to model inputs is a method for assessing the adequacy of the model with respect to its intended function.

1.3 After a model has been calibrated, a modeler may vary the value of some aspect of the conditions applying solely to the prediction simulations in order to satisfy some design criteria. For example, the number and locations of proposed pumping wells may be varied in order to minimize the required discharge. Insofar as these aspects are controllable, variation of these parameters is part of an optimization procedure, and, for the purposes of this guide, would not be considered to be a sensitivity analysis. On the other hand, estimates of future conditions that are not controllable, such as the recharge during a postulated drought of unknown duration and severity, would be considered as candidates for a sensitivity analysis.

1.4 This guide presents the simplest acceptable techniques for conducting a sensitivity analysis. Other techniques have been developed by researchers and could be used in lieu of the techniques in this guide.

1.5 This guide is written for performing sensitivity analyses for groundwater flow models. However, these techniques could be applied to other types of groundwater related models, such as analytical models, multi-phase flow models, non-continuum (karst or fracture flow) models, or mass transport models.

1.6 This guide is one of a series on groundwater modeling codes (software) and their applications, such as Guide [D5447](#)

and Guide [D5490](#). Other standards have been prepared on environmental modeling, such as Practice [E978](#).

1.7 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.8 *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.*

1.9 *This guide offers an organized collection of information or a series of options and does not recommend a specific course of action. This document cannot replace education or experience and should be used in conjunction with professional judgment. Not all aspects of this guide may be applicable in all circumstances. This ASTM standard is not intended to represent or replace the standard of care by which the adequacy of a given professional service must be judged, nor should this document be applied without consideration of a project's many unique aspects. The word "Standard" in the title of this document means only that the document has been approved through the ASTM consensus process.*

2. Referenced Documents

2.1 ASTM Standards:²

[D653 Terminology Relating to Soil, Rock, and Contained Fluids](#)

[D5447 Guide for Application of a Groundwater Flow Model to a Site-Specific Problem](#)

[D5490 Guide for Comparing Groundwater Flow Model Simulations to Site-Specific Information](#)

[E978 Practice for Evaluating Mathematical Models for the Environmental Fate of Chemicals](#) (Withdrawn 2002)³

¹ This guide 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.

³ The last approved version of this historical standard is referenced on www.astm.org.