



Standard Guide for Describing the Functionality of a Groundwater Modeling Code¹

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1. Scope*

1.1 This guide presents a systematic approach to the classification and description of computer codes used in groundwater modeling. Due to the complex nature of fluid flow and biotic and chemical transport in the subsurface, many different types of groundwater modeling codes exist, each having specific capabilities and limitations. Determining the most appropriate code for a particular application requires a thorough analysis of the problem at hand and the required and available resources, as well as a detailed description of the functionality of potentially applicable codes.

1.2 Typically, groundwater modeling codes are non-parameterized mathematical descriptions of the causal relationships among selected components of the aqueous subsurface and the chemical and biological processes taking place in these systems. Many of these codes focus on the presence and movement of water, dissolved chemical species and biota, either under fully or partially saturated conditions, or a combination of these conditions. Other codes handle the joint movement of water and other fluids, either as a gas or a nonaqueous phase liquid, or both, and the complex phase transfers that might take place between them. Some codes handle interactions between the aqueous subsurface (for example, a groundwater system) and other components of the hydrologic system or with nonaqueous components of the environment.

1.3 The classification protocol is based on an analysis of the major function groups present in groundwater modeling codes. Additional code functions and features may be identified in determining the functionality of a code. A description of a code's functionality contains the details necessary to understand the capabilities and potential use of a groundwater modeling code. Tables are provided with explanations and examples of functions and function groups for selected types of codes. Consistent use of the descriptions provided in the

classification protocol and elaborate functionality analysis form the basis for efficient code selection.

1.4 Although groundwater modeling codes exist for simulation of many different groundwater systems, one may encounter situations where existing code is available or applicable. In those cases, the systematic description of modeling needs may be based on the methodology presented in this guide.

1.5 This guide is one of a series of guides on groundwater modeling codes and their applications, such as Guides [D5447](#), [D5490](#), [D5609](#), [D5610](#), [D5611](#), and [D5718](#).

1.6 Full adherence to this guide may not be feasible. For example, research developments may result in new types of codes not yet described in this guide. In those cases, code documentation should contain a section containing a full description of a code's functions, features, and capabilities.

1.7 *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](#)

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.