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Standard Guide for Selection of Data Elements for Groundwater Investigations[1]

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1. Scope

1.1 This guide covers the selection of data elements for the documentation of groundwater sites. The data elements are described in four ASTM standards outlining information that may be collected at groundwater sites. Examples of specific investigations are given with the logic of why to select individual and combinations of data elements to meet the requirements of the studies.

NOTE 1—A groundwater site is any source, location, or sampling station capable of producing water or hydrologic data from a natural stratum from below the surface of the earth. A source or facility can include a well, spring or seep, and drain or tunnel (nearly horizontal in orientation). Other sources, such as excavations, driven devices, bore holes, ponds, lakes, and sinkholes, that can be shown to be hydraulically connected to the groundwater, are appropriate for the use intended.

NOTE 2—The four ASTM standards that describe the data elements for groundwater are Practice D5254 and Guides D5408, D5409, and D5410.

1.2 Systematic and consistent data collection are necessary for the investigation of the availability and the protection or restoration of groundwater resources. The level of detail, precision and bias, and the type of data that need to be collected depend on the objective of the study, the expected complexity of the system, and the resources available for the investigation. This guide presents ideas on what information should be collected for specific studies, why certain data elements are mandatory, and the importance to current and future investigations of maintaining quality control on the collection and retention of these data. This guide focuses on those data elements that are gathered at the field-site location and are used to assist in interpreting the hydrology of the groundwater source and to meet regulatory requirements. Other analytical and quality assurance/quality control (QA/QC) considerations are addressed in other standards and beyond the scope of this guide.

1.3 *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.*

1.4 *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

D5254 Practice for Minimum Set of Data Elements to Identify a Ground-Water Site

D5408 Guide for Set of Data Elements to Describe a Groundwater Site; Part One—Additional Identification Descriptors

D5409 Guide for Set of Data Elements to Describe a Ground-Water Site; Part Two—Physical Descriptors

D5410 Guide for Set of Data Elements to Describe a Ground-Water Site;Part Three—Usage Descriptors

3. Terminology

3.1 *Definitions:*

3.1.1 Except as listed as follows, all definitions are in accordance with Terminology D653.

3.1.2 *code*—a suggested abbreviation for a component, for example, "G" is the code suggested for the galvanized iron component of data element casing material. The data element is in the "casing record" record.

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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.

3.1.3 *component*—a subdivision of a data element, for example, galvanized iron is one of 30 components suggested for data element casing material. The data element is in the casing record record.

3.1.4 *data element*—an individual segment of information about a groundwater site, for example, casing material. The data element is in the casing record record.

3.1.5 *record*—denotes a set of related data elements that may need to be repeated to fully describe a groundwater site. For example, a well that consists of several diameters of casing from the top end to the bottom will need more than one casing record record (the record includes data elements depth to top, depth to bottom, diameter, casing material, and casing thickness) to fully describe the construction of the well. However, if only a single size of casing is used in the well, the record is utilized once.

3.1.6 *record group*—a set of related records. For example, the lift record group includes the lift record, power record, and standby record. Some record groups consist of only one record, for example, the spring record group includes only the spring record.

4. Summary of Guide

4.1 This guide describes four representative categories of investigations to demonstrate the logic of selecting data elements for the documentation of groundwater data. Included in this guide is a series of four tables that list the records (groups of data elements) used for the examples. The tables cross-reference the sections in this guide where specific explanations for data elements are found. A complete list of the individual data elements for each record is included in the text of this guide. The minimum set of data elements is standard and mandatory with all types of groundwater investigations and is presented in 6.1.3.

5. Significance and Use

5.1 Data are gathered at groundwater sites for many purposes. Each purpose requires a different combination of data elements. However, it is mandatory that every groundwater site include a minimum set of data elements to uniquely identify that site by precisely locating with coordinates and political regimes, absolutely identifying the owner and data source, and clearly defining the basic site characteristics. This information is described in Practice D5254.

5.2 As a part of a groundwater project, each site requires additional data elements, beyond the minimum set, to assist in the interpretation of the local and areal hydrology. As an example, for a hydrologic reconnaissance study of a groundwater basin, each well or spring site requires basic information concerning construction, water level, yield, geology, and water chemistry. Additional information is needed if the project is a waste facility investigation, usually to satisfy local, state, and federal environmental regulations.

6. Documentation

6.1 *Introduction:*

6.1.1 Four representative hydrologic projects with very different objectives are provided as examples to demonstrate what data elements may be selected for a comprehensive groundwater data file (Tables 1-4). When designing a groundwater data file, data elements from all four ASTM guides should be considered (see Note 2). Agencies or companies that engage in widely diverse projects involving groundwater resources may require nearly all of the data elements described in the four standards. Those organizations should design a permanent file system to their specifications that includes these data.

NOTE 3—A groundwater data file can be stored as various media such as flat files in cabinets or as digital records on a computer. No matter which system is used, the data elements retained are the same information. An advantage of using a computerized file is that the data base containing the groundwater information can be easily displayed, duplicated, and transferred to another computer. Advantages of paper flat files include low cost, easy access without equipment, and transportability to field locations and meetings.

NOTE 4—For the explanation of groundwater investigations in this guide, the term "well" is used to mean any test or finished hole (that is, casing, screen, pump, etc.) that penetrates the surface of the earth to access the groundwater source. These include drilled, bored, driven, and dug holes.

6.1.2 Some agencies or companies may be very specialized in the objective of their projects and require only a finite number of data elements beyond the minimum data set. However, a limited data file may be expanded at a later date by adding additional data elements to satisfy the requirements of more extensive projects.

6.1.3 The minimum set of data elements (see Practice D5254) is mandatory to uniquely locate, identify, and describe each individual groundwater site. In addition, photographs,

TABLE 1 General Resource Appraisal Investigation of an Area[A]

Minimum Set of Data Elements (see 6.1.3):
Geographic Location (see 6.1.3.1)
Political Regimes (see 6.1.3.2)
Source Identifiers (see 6.1.3.3)
Individual Site Characteristics (see 6.1.3.4)
Additional Data Elements (see X1.6):
Geographic Location Record (see X1.6.1)
Owner Record (see X1.6.2)
Site Visits Record (see X1.6.3)
Other Identification Record (see X1.6.4)
Remarks Record (see X1.6.5)
Individual Site Characteristics Record (see X1.6.6)
Construction Record (see X1.6.7)
Casing Record (see X1.6.8)
Opening/Screen Record (see X1.6.9)
Lift Record (see X1.6.10)
Power Record (see X1.6.11)
Geophysical Log Record (see X1.6.12)
Geohydrologic Unit Record (see X1.6.13)
Hydraulics Record (see X1.6.14)
Aquifer Parameters Record (see X1.6.15)
Well Clusters Record (see X1.6.16)
Collector Well/Laterals Record (see X1.6.17)
Ponds Record (see X1.6.18)
Tunnel or Drain Record (see X1.6.19)
Spring Record (see X1.6.20)
Measuring-Point Record (see X1.6.21)
Water-level Record (see X1.6.22)
Discharge Record (see X1.6.23)
Water-Quality Record (see X1.6.24)
Field Water-Quality Record (see X1.6.25)

[A] See Appendix X1.