



## Standard Guide for Set of Data Elements to Describe a Groundwater Site; Part One—Additional Identification Descriptors<sup>1</sup>

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<sup>ε1</sup> NOTE—The units statement in 1.4 was revised and inch-pound units were deleted throughout editorially in August 2010.

### 1. Scope

1.1 This guide covers Part One of three guides to be used in conjunction with Practice D5254 that delineates the data desirable to describe a groundwater data collection or sampling site. This guide describes additional information beyond the minimum set of data elements that may be needed to identify a groundwater site. Part Two identifies physical descriptors, such as construction, for a site, while Part Three identifies usage descriptors, such as monitoring, for an individual groundwater site.

NOTE 1—A groundwater site is defined as 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—Part Two (Guide D5409) includes individual site characteristic descriptors (7 data elements), construction descriptors (56 data elements), lift descriptors (16 data elements), geologic descriptors (26 data elements), hydraulic descriptors (20 data elements), and spring descriptors (11 data elements). Part Three (Guide D5410) includes monitoring descriptors (77 data elements), irrigation descriptors (4 data elements), waste site descriptors (9 data elements), and decommissioning descriptors (8 data elements). For a list of descriptors in this guide, see Section 4.

1.2 These data elements are described in terms used by groundwater hydrologists. Standard references, such as the Glossary of Geology and various hydrogeologic professional publications, are used to determine these definitions. Many of the suggested elements and their representative codes are those established by the Water Resources Division of the U.S. Geological Survey and used in the National Water Information Systems computerized data base (1-9).<sup>2</sup>

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<sup>2</sup> The boldface numbers in parentheses refer to a list of references at the end of the text.

NOTE 3—The purpose of this guide is to suggest data elements that can be collected for groundwater sites. This does not uniquely imply a computer data base, but rather data elements for entry into any type of permanent file.

NOTE 4—Component and code lists given with some of the data elements, for example “Format of Other Data,” are only suggestions. These lists can be modified, expanded, or reduced for the purpose intended by the company or agency maintaining the groundwater data file.

NOTE 5—Use of trade names in this guide is for identification purposes only and does not constitute endorsement by ASTM.

1.3 This guide includes the data elements desirable to identify a groundwater site beyond those given in the “Minimum Set of Data Elements.” Some examples of the data elements are map identification, permitting facts, and supporting information. No single site will need every data element, for example, many groundwater sites do not need the data elements described in the legal record group. Each record (group of related data elements) for a site has mandatory data elements, such as the date for the ownership record. However, these elements are considered necessary only when that specific record is gathered for the site.

1.4 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.5 *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.*

1.6 *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:*<sup>3</sup>

**D653** Terminology Relating to Soil, Rock, and Contained Fluids

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

**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 For definitions of terms applicable to this guide, see Terminology **D653**.

### 3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *code*—a suggested abbreviation for a component, for example, “F” is the code suggested for the “Files (Raw Data)” component of data element “Format of Other Data.”

3.2.2 *component*—a subdivision of a data element, for example, “Files (Raw Data)” is one of four components suggested for data element “Format of Other Data.”

3.2.3 *data element*—an individual segment of information about a groundwater site, for example, “Format of Other Data.” The data element is in the “Other Data Record” record.

3.2.4 *record*—a set of related data elements that may need to be repeated to fully describe a groundwater site. For example, a groundwater site that has a series of separate data files will need more than one “Other Data Record” record (the record includes data elements, other data type, other data location, and format of other data) to fully document the history of the site. However, if only a single separate data file exists for the well, the record is utilized once.

3.2.5 *record group*—a set of related records. For example, the “Supporting Information Record Group” includes the owner record, site visits record, other identification record, other data record, and remarks record. Some record groups consist of only one record, for example, the “Legal Record Group” includes only the legal record.

## 4. Summary of Guide

4.1 This guide includes the following additional identification descriptor data elements to describe a groundwater site. The universal element accompanies any data element requiring a confidence classification. Single elements usually need one entry for a site, while repeated elements commonly require several records to fully describe the conditions and history of the site:

Universal Element  
Data Confidence Classification  
Single Elements  
Geographic Location:

Land-Net Location  
Location Map  
Map Scale  
Method Altitude Determined  
Political Regimes  
Congressional District  
Source Identifiers:  
Mean Greenwich Time Offset  
Site Reference in Report  
Site in a Computer Data Base  
Photography/Sketch Available of Site  
Repeated Elements  
Legal Record Group:  
Legal Record:  
Permitting Agency  
Priority Date  
Application Number  
Application Date  
Certification Number  
Certification Date  
Permit Number  
Permit Date  
Water Allocation  
Supporting Information Record Group  
Owner Record:  
Date of Ownership  
Owner’s Name  
Site Visits Record:  
Date of Visit  
Person Who Made Visit  
Purpose of Visit  
Other Identification Record:  
Other Name, Number, or Identification  
Assigner  
Other Data Record:  
Other Data Type  
Other Data Location  
Format of Other Data  
Remarks Record:  
Remark Date  
Remark  
Remark Source

## 5. Significance and Use

5.1 Data at groundwater sites are gathered for many purposes, each of which generally requires a specific set of data elements. For example, when groundwater quality is a concern, not only are the minimum set of data elements required for the site, but information concerning the sample collection depth interval, method of collection, and date and time of collection are needed to fully qualify the data. Another group of elements are recommended for each use of the data, such as aquifer characteristics or water-level records. Normally the more information that is gathered about a site by field personnel, the easier it is to understand the groundwater conditions and to reach valid conclusions and interpretations regarding the site.

5.2 The data elements listed in this guide and Guides **D5409** and **D5410** should assist in planning what information can be gathered for a groundwater site and how to document these data.

NOTE 6—Some important data elements may change during the existence of a site. For example, the elevation of the measuring point used for the measurement of water levels may be modified because of repair or replacement of equipment. This frequently occurs when the measuring point is an opening in the pump and the pump is modified or replaced. Because changes cannot always be anticipated, it is preferable to reference the height of the measuring point to a nearby, permanent altitude datum. The measuring point is referenced by being the same altitude (zero correction) or above (negative correction) or below (plus correction) the altitude datum. All appropriate measurements should be corrected in

<sup>3</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard’s Document Summary page on the ASTM website.

reference to the altitude datum before entry into the permanent record. Care must be exercised to keep the relationship of these data elements consistent throughout the duration of the site.

5.3 Some data elements have an extensive list of components. For example, the aquifer identification list described in Guide **D5409**, has over 5000 components. Lengthy lists of possible components are not included in this guide, however, information on where to obtain these components is included with the specific data element.

NOTE 7—This guide identifies many sources, lists, etc., of information required to completely document information about any groundwater site.

## 6. Documentation of Universal Element

6.1 For any element that requires a Confidence Classification, document the data confidence classification for that specified critical data element for the groundwater site. Field-measured or laboratory-determined values have varying degrees of accuracy depending upon the methods used to obtain the information. This subjective or judged confidence should be documented for each measured data element by the agency or company that gathered or recorded the information, or both. Suggested components for the data confidence classification and representative codes are as follows:

A—Value is accurate to within the tolerance of the measurement instrument.

I—Value is judged to be inaccurate due to improper instrumentation or bias instrumentation or laboratory methods.

N—Not verified, value was obtained from another source and due to the nature of the data, cannot be verified.

NOTE 8—At a minimum, it is important, and often sufficient, that data be classified subjectively by experienced professionals. It is not always possible or necessary to objectively quantify the confidence that a data user might have in a data value, but a professional classification can be useful. For the purposes of the three guides, the word confidence refers to a subjective professional judgment on data accuracy as represented by the three data confidence classification components, and does not imply the more rigorous confidence limits or interval as used by statisticians.

NOTE 9—A critical data element is one that the value can be field measured or laboratory determined with an instrument that has a statistically resolved degree of precision. Many data elements gathered for groundwater sites require no accompanying confidence classification, for example, owner's name, location map, type of lift, etc. Each data element that generally requires an accompanying confidence classification will be so noted in these guides.

## 7. Documentation of Miscellaneous Singular Data Elements

7.1 *Introduction*—A vast number of data elements can be documented about a groundwater site to thoroughly describe its location, physical features, relationship to other features on the earth's surface, and to designate what information is gathered at the site. These data elements typically are transcribed once for a site, in contrast to data elements that may be repetitive, such as water levels. Many of these data are extremely valuable in the characterization of sites that fall into certain categories, for example wells, for which the location map is an essential element to assist in properly positioning the well.

### 7.2 *Geographic Location:*

7.2.1 *Land-Net Location*—In addition to the locational data required by the minimum set of data elements, land-net location may be a general land office description of the site's position on the surface of the earth. This description is used in

many parts of the United States to subdivide the land into sections, townships, and ranges for the purpose of governmental administration and originally was used (beginning in 1786) as a systematic method for the disposal of unoccupied land **(10)**. An abbreviated form of this description is used by many water agencies, in the many parts of the country, as the primary method of systematically cataloging groundwater sites. The method allows for the location of sites to a minimum of a one hectare tract ( $\frac{1}{256}$  th of a section) within a specified section, township, range, and meridian. The meridian designation must be included to denote where the township and range are located in the National grid system. An example of a one hectare location is "Northeast  $\frac{1}{4}$  of the Southeast  $\frac{1}{4}$  of the Northwest  $\frac{1}{4}$  of the Southwest  $\frac{1}{4}$ , Section 22, Township 45 South, Range 87 West, Boise meridian." This location is usually abbreviated to a form similar to "NESENWSW Sec. 22, T45S, R87W B." A number of formats comparable to this abbreviation have been established by the various agencies that use the system, however, they basically communicate the same results **(5, 6, 11, 12)**.

NOTE 10—The accuracy of this location method for the minimum one hectare area is about 70.104 m, that corresponds to between 2 and 3 s of latitude or longitude. Surveying errors are common in the original measurements. See FIPS PUB 70-1.<sup>4</sup>

NOTE 11—To supplement the description of the location of a groundwater site, a common method used is to draw a sketch showing the relationship of the site to other features in the immediate area, such as roads, buildings, etc. In addition, a sketch of the measuring point can assist in defining its exact location at the site. Photographs of the site and measuring point commonly are used as a part of the description.

7.2.2 *Location Map*—The location map name that is documented is that or the best available map of the area where the site is located. Much of the United States is covered by U.S. Geological Survey (USGS) topographic quadrangles. However, for those areas without USGS maps, the name of the map that shows the site's location should be documented. In addition, record the map's source, such as county highway or Army Map Service. The availability and identification of the USGS maps are given on individual State topographic map indexes. These indexes and the individual topographic maps can be obtained from USGS Public Inquires Office **(5, 9, 13)**.<sup>5</sup>

NOTE 12—Many mapped areas are available on a computer-stored Geographical Information System (GIS). Document information required to identify and obtain the GIS map of the area where the site is located.

7.2.3 *Map Scale*—Document the scale of the map that is used to locate the site. This value helps to define the accuracy of the site location data **(5)**.

NOTE 13—The map scale is the ratio between the linear distance on a map and the corresponding distance on the surface being mapped. For example, 1 mm = 1 m or the equivalent 1:1000, are ways of expressing the same ratio.

7.2.4 *Method Altitude Determined*—Document the method used to determine the altitude of the reference datum at the

<sup>4</sup> FIPS PUB 70-1, *Representation of Geographic Point Locations for Information Interchange*, is available from National Technical Information Service, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, VA 22161.

<sup>5</sup> Public Inquires Office, U.S. Geological Survey, 503 National Center, Room 1-C-402, 12201 Sunrise Valley Drive, Reston, VA 22092.

groundwater site. Suggested method altitude determined components and representative codes are as follows (5):

- A—Altimeter,
- L—Level or other surveying method,
- M—Interpolated from topographic map, and
- Z—Other, explain (for example, historical local datum).

7.3 *Political Regimes*—Document the political regime (for example, Congressional district) where the site is physically located. The date of documentation should be included because of changes that are commonly made in the boundaries of the districts. This allows for determining the legislative responsibility of the site. A guide to these districts is defined in FIPS PUB 9-1 (14).<sup>6</sup>

NOTE 14—Congressional district boundaries can be modified over time because of population changes. Care must be exercised in using this data element to ensure that the groundwater site is still in the originally assigned District.

7.4 *Source Identifiers:*

7.4.1 *Mean Greenwich Time Offset*—Much of the data collected at a groundwater site is time related, such as water-level measurements or water-quality samples. Document, where applicable, the mean Greenwich time offset or United States time zone of the site, so that the time-dimension can be reduced to a common denominator.

7.4.2 *Site Referenced in Report*—If this site has been used or is referenced in a report, document the data concerning the published or unpublished report(s) and, if available, the identification of the report and the address of where to obtain a copy.

7.4.3 *Site in a Computer Data Base*—Document whether or not the information concerning the site has been entered into a computer data base and, if in a data base, the location. Show the data base management system (DBMS) used to organize the data base, for example, “INGRES,” a relational DBMS. Give the name assigned to the data base containing the site, for example, “WATSTORE,” the U.S. Geological Survey water data base.

7.4.4 *Photography/Sketch Available of Site*—Document the existence of a photograph or sketch of the site, or both. Photographs and sketches of the site and associated facility, including the measuring point, are valuable pictorial material to enhance the site description.

NOTE 15—An example of a form (see Fig. 1) for documenting the data elements as described under “Miscellaneous Singular Data Elements” is illustrated here to show a method of design for this tool. These forms are commonly known as field forms or as coding forms (for computer entry). This type of form is routinely used for transcribing field data while at the groundwater site and entering non-field information at the agency’s or company’s office. It should be noted that each form has the site identification (primary identification as used by the agency or company), date of field visit, and person that recorded the data as the first entries. These three data items are mandatory to ensure correct filing of the information, either in cabinets or in a computer data base, and for quality control.

<sup>6</sup> FIPS PUB 9-1, *Congressional Districts of the United States* is available from National Technical Information Service, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, VA 22161.

<b>GROUND-WATER SITE MISCELLANEOUS SINGULAR DATA ELEMENTS</b>	
<b>Site Identification</b> _____	<b>Date Prepared</b> _____
<b>Prepared by</b> _____ <b>(Name)</b>	
<b>Geographic Location:</b>	
<b>Land-net Location</b> _____ <b>(U.S. General Land Office)</b>	
<b>Location Map</b> _____ <b>(Name)</b>	
<b>Map Scale</b> _____ <b>(Ratio of Map to Land Surface Distance)</b>	
<b>Method Altitude Determined</b> _____ <b>(Altimeter, Surveyed, Interpolated, or Other)</b>	
<b>Political Regimes:</b>	
<b>Congressional District</b> _____ <b>(Name)</b>	
_____ <b>(Date)</b>	
<b>Source Identifiers:</b>	
<b>Mean Greenwich Time Offset</b> _____ <b>(Hour Offset or U.S. Time Zone)</b>	
<b>Site Used in Report</b> _____ <b>(Title)</b>	
<b>Site in a Computer Data Base</b> _____ <b>(Name)</b>	
_____ <b>(Location)</b>	
<b>Photograph or Sketch Available</b> _____ <b>(Identify)</b>	

FIG. 1 Example Form

8. Documentation of Miscellaneous Repetitive Data Elements

8.1 Introduction:

8.1.1 Many of the groundwater elements require multiple records to completely describe a site. Time-related elements, such as water levels, discharge measurements, and water chemistry, may need hundreds or thousands of records for a period of many years to document measurements at a single site. These time-related data help to determine historical trends and serve to establish bench-mark standards for the site.

8.1.2 Other data elements that are not time related, such as casing, lengths, spring openings, and an array of geophysical logs, require a sequence of records to thoroughly describe the site. These data are extremely valuable in site characterization, for example, wells for which the construction components are essential to understand the source of the water.

8.2 Legal Record Group:

8.2.1 *Legal Record*—The legal record includes information about any regulatory agencies or authorities, such as for establishment of the right-to-use water and the amount of water allocated for use at a groundwater site. This legal record is normally administered by a government agency or government authorized agency (for example, groundwater management district or health department) within the specific state. Some states use the method of permitting to assemble site records.

8.2.1.1 *Permitting Agency*—If applicable, document the name and address of the agency that is responsible for issuing the permit for the legal development of water at the site.

8.2.1.2 *Priority Date*— If applicable, document the date, in year, month, and day (YYYYMMDD), that establishes the legal priority for use of water at the groundwater site. If necessary, show the time of day that the priority was authorized.

8.2.1.3 *Application Number*—If applicable, document the number or identification assigned by the agency to the application for the permit.

8.2.1.4 *Application Date*—If applicable, document the application date, in year, month, and day (YYYYMMDD), for the groundwater site. If necessary, document the time of day.

8.2.1.5 *Certification Number*—If applicable, document the number or identification assigned by the agency to the certification credential.

8.2.1.6 *Certification Date*—If applicable, document the certification date, in year, month, and day (YYYYMMDD), for the groundwater site. If necessary, document the time of day.

8.2.1.7 *Permit Number*—If applicable, document the number or identification assigned by the agency to the permit for the use of water at the site.

8.2.1.8 *Permit Date*—If applicable, document the date, in year, month, and day (YYYYMMDD), the permit was issued for the groundwater site by the responsible agency. If necessary, document the time of day.

8.2.1.9 *Water Allocation*—If applicable, document the amount of water allocated by the permitting agency to the permit holder for the subject permit. Include the measurement unit utilized for the water allocation.

### 8.3 *Supporting Information Record Group:*

8.3.1 *Owner Record*—The owner’s record is used to document a history of ownership of the groundwater site. This record is important to aid in the proper identification of the site and to assign the responsibility for the facility. The following data elements are required to document the history of ownership (5).

8.3.1.1 *Date of Ownership*—If applicable, document the date, in year, month, and day (YYYYMMDD), that the owner acquired possession of the groundwater site.

8.3.1.2 *Owner’s Name*—Document the name of the owner and owner’s address that corresponds with the date of ownership for the event record.

8.3.2 *Site Visits Record*—The sites visits record is used to document data collection, verification, and quality-control visits to the groundwater site. The following data elements are required to document the history of these site visits (5).

8.3.2.1 *Date of Visit*—If applicable, document the date, in year, month, and day (YYYYMMDD), that the site was visited. If necessary, document the time of day.

8.3.2.2 *Person Who Made Visit*—If applicable, document the name, title, and address of person who made the visit to the groundwater site for the record event.

8.3.2.3 *Purpose of Visit*—If applicable, document a description of the purpose of the visit to the groundwater site.

8.3.3 *Other Identification Record*—Many groundwater sites have more than one identification. These identifiers can be

assigned by a company, state agency, or federal agency to conform with an internal file system. To aid in the tracking of data for a site, the following data elements may be required (5).

8.3.3.1 *Other Name, Number, or Identification*—If applicable, document the groundwater site identification that was assigned by the other company or agency.

8.3.3.2 *Assigner*—Document the name and address of the person, company, or agency that assigned the other identification for this event record.

8.3.4 *Other Data Record*—The other data available record is used to indicate the availability of additional data pertinent to the groundwater site. Many sites have detailed information, such as continuous water-level recorder charts, geophysical logs, detailed geological logs, and extensive water-quality analyses, that may not be filed at a central location. These data are valuable in understanding conditions at the site (5).

8.3.4.1 *Other Data Type*—If applicable, describe the type of other data available for the groundwater site.

8.3.4.2 *Other Data Location*—If applicable, document the location of the other data for the groundwater site. The complete name and address of the holder of the data should be documented.

8.3.4.3 *Format of Other Data*—If applicable, document the format of the other data available. Suggested other data available components and representative codes are as follows

F—Files (raw data),  
M—Machine readable (computer),  
P—Published (report or basic-data release), and  
Z—Other (describe).

8.3.5 *Remarks Record*—The remarks record is used for documenting meaningful information about the site for which no specific data elements are defined (5).

8.3.5.1 *Remark Date*—If applicable, document the date, in year, month, and day (YYYYMMDD), of the origin of the remark.

8.3.5.2 *Remark*—If applicable, document information concerning the site that does not conform to any of the data elements that are listed in these guides.

8.3.5.3 *Remark Source*—Document the name and address of the person, company, or agency that wrote the remark for this event record.

## 9. Keywords

9.1 data confidence classification; data element; groundwater; monitoring location; sampling site; site identification; site location; water allocation; water quality



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