

POLICY AND PROCEDURES  
FOR THE MANAGEMENT AND  
ARCHIVAL STORAGE OF DATA COLLECTED  
FOR HYDROLOGIC INVESTIGATIONS,  
U.S. GEOLOGICAL SURVEY, INDIANA DISTRICT

By Jeffrey D. Martin and David A. Cohen

U. S. GEOLOGICAL SURVEY  
Open-File Report 94-61



Indianapolis, Indiana

1993

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## CONVERSION FACTORS, ABBREVIATIONS, AND VERTICAL DATUM

<b>Multiply</b>	<b>By</b>	<b>To Obtain</b>
inch (in.)	25.4	millimeter
foot (ft)	0.3048	meter

The following abbreviations are used in this report:

<b><u>Abbreviation</u></b>	<b><u>Description</u></b>
USGS	U.S. Geological Survey
WRD	Water Resources Division
site ID	site identifier
GW	site type: ground water other than spring
SP	site type: spring
LK	site type: lake
SW	site type: stream
ME	site type: meteorological
SS	site type: specific source
DBA(s)	Data Base Administrator(s)
DS	Discipline Specialists
ADAPS	Automated Data Processing System
EDOC	Electronic Documents
FIPS	Federal Information Processing Standards
GWSI	Ground-Water Site Inventory System
NWIS	National Water Information System
QWDATA	Water-Quality System
WATSTORE	Water Data Storage and Retrieval System
WUDS	Water-Use Data System

**Sea level:** In this report, “sea level” refers to the National Geodetic Vertical Datum of 1929 (NGVD of 1929)—a geodetic datum derived from a general adjustment of the first-order level nets of the United States and Canada, formerly called Sea Level Datum of 1929.

# Policy and Procedures for the Management and Archival Storage of Data Collected for Hydrologic Investigations, U.S. Geological Survey, Indiana District

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## ABSTRACT

This report describes the policy and procedures used by the Indiana District to manage and store data collected during hydrologic investigations. It is the policy of the Indiana District that data collected to meet the objectives of projects for hydrologic investigations be documented, organized, and archived in a manner that (1) facilitates retrieval, evaluation, and use by District personnel and others; and (2) enables verification of data contained in all reports and computer data bases.

Procedures for the management of project data for hydrologic investigations are the following:

1. Data-collection sites are properly established, named, and plotted on Master Site-File topographic maps.
2. Complete and clear field notes are taken during each site visit.
3. A complete and well-organized paper file for each data-collection site is maintained.

4. Pertinent data are stored in the appropriate National Water Information System data base.
5. Data are compared and verified in field notes, laboratory sheets, data bases, and all reports; all discrepancies are resolved and noted in the paper files and in archived copies of all reports.
6. At the end of the project, paper files for each data-collection site and important project files are archived in the District library.

## INTRODUCTION

Scientific data collected by the U.S. Geological Survey (USGS) is a valuable national resource that must be managed properly (Biesecker, 1991). Data-collection activities in the Water Resources Division (WRD) of the USGS commonly are divided into two principal programs: basic-data collection and hydrologic investigations. Basic-data programs provide routine, ongoing data from a nationwide system of

stream-gaging stations, ground-water observation wells, and surface- and ground-water-quality sampling sites. These data usually are obtained to assess long-term trends and to establish base-line conditions for the Nation's water resources (USGS, 1984a). Basic-data programs of the USGS are recognized widely for their excellent data management. This excellence has resulted from the use of long-established procedures, training, and careful review. Most hydrologic investigations are in response to a recognized problem or an anticipated potential problem (USGS, 1984b). Data-collection activities of hydrologic investigations use a wide variety of procedures and usually are more site specific, more problem-oriented, and of shorter duration than those of basic-data programs. There often is a greater emphasis on understanding hydrologic systems than on data management and record keeping.

The Indiana District has developed a policy and procedures to improve data management for hydrologic investigations. The policy establishes standards for the management and storage of data collected for hydrologic investigations. The procedures delineate the specific activities required to achieve those standards.

## **Purpose and Scope**

The purpose of this report is to describe the policy and procedures used by the Indiana District to manage and store data collected as part of hydrologic investigations. The policy and procedures described herein apply to data collected for hydrologic investigations after Fiscal Year 1990. Hydrologic investigations include District projects having individual account numbers and "spin-off" or short-term projects funded under basic-data-collection account numbers. All data, published and unpublished, are covered by the policy and procedures. In general, data used in analysis and information related to data analysis or interpretations are covered by the policy and procedures. Additional examples are given in the section, "Data-Management Procedures."

## **Benefits of Proper Data Management**

Data collected for hydrologic investigations usually are documented, organized, and archived to meet the short-term needs of each project. More thought must be given to the needs of future projects, District-wide uses of the data, and the needs of other users. The problems of meeting only current project needs are readily apparent: lost data, greater effort required to retrieve data, incorrect well numbers and well names, duplicate or triplicate Site-File or water-quality entries, "lost" information (knowledge) when project personnel leave the District, difficulty in responding to information requests, and the inability to verify data stored in computer data bases or published in reports. Incomplete data in computer data bases and paper files limit the utility of the data.

Proper data management will eliminate many of the problems described in the preceding paragraph. Properly managed data will facilitate and improve the retrieval, evaluation, quality assurance, use, and storage of hydrologic and related data. As a result, data users can increase their productivity, and hydrologists and the public can have a higher degree of confidence in USGS data and reports.

## **DATA-MANAGEMENT POLICY**

It is the policy of the Indiana District that data collected to meet the objectives of projects for hydrologic investigations be documented, organized, and archived in a manner that (1) facilitates retrieval, evaluation, and use by District personnel and others, and (2) enables an independent verification of data contained in all reports and computer data bases.

## **DATA-MANAGEMENT PROCEDURES**

Procedures for the management of data collected for hydrologic investigations are:

1. Data-collection sites are properly established, named, and plotted on Master Site-File topographic maps.
2. Complete and clear field notes are taken during each site visit.
3. A complete and well-organized paper file for each data-collection site is maintained.
4. Pertinent data are stored in the appropriate National Water Information System (NWIS) data bases.
5. Data are compared and verified in field notes, laboratory sheets, data bases, and all reports. All discrepancies are resolved and noted in the paper files for each data-collection site, in the project files, and in archived copies of all reports.
6. At the end of the project, paper files for each data-collection site and important project files are archived in the District library.

### **Establishing, Naming, and Plotting Sites**

The Site File should contain important information on site identity, characteristics, and location. In the Indiana District, the NWIS data bases are plagued by duplicate Site-File entries for the same site, and data retrieval and use is limited by incomplete Site-File entries. To eliminate the creation of duplicate Site Files and improve the usability of the NWIS data bases in Indiana, four steps are required to establish a data-collection site:

1. The person requesting establishment of a new site plots the site on a topographic map (1:24,000 scale) and uses a digitizing table to determine the latitude and longitude to an accuracy of plus or minus one second. It is the responsibility of the Project Chief to ensure that new sites have been field checked

and are accurately plotted on topographic maps. The person requesting establishment of the site suggests a site identifier (site ID). The site ID will be approved by the Data Base Administrator (DBA) for the Site File. The site ID is composed of a 5-character agency code followed by an 8- or 15-digit site number. Eight-digit numbers are used for establishing the downstream order of surface-water and lake sites with Automated Data Processing System (ADAPS) data and are assigned by the ADAPS DBA. Fifteen-digit numbers are used for all other sites, including miscellaneous surface-water and lake sites, and are composed of the latitude, longitude, and a 2-digit sequence number. The first site at a given latitude and longitude has a sequence number of 01, and the 100th site with the same latitude and longitude has a sequence number of 00.

The person requesting establishment of a new site also suggests a name for the site. The site name will be approved by the Site-File DBA. All site names, except special quality-assurance/quality-control sites, should have a project-related identifier (for example, WELL 32D or SITE R-101-4) and must have the words "AT" or "NEAR" and the name of the nearest named community on a topographic map (scale 1:24000). "AT" is used when the site is within 1 mile of the named community. "NEAR" is used when the site is more than 1 mile from the named community. The two-letter postal abbreviation code for the State of the named community ends the name. An example of a correct site name would be "USGS WELL 32D NEAR MILFORD, IN". For sites located near the Indiana border, the nearest named

community may be in a neighboring state. In these cases, the two-letter postal abbreviation for the neighboring state in which the nearest named community is located ends the site name. For example, if site R-101-4 in Indiana is located 500 feet east of the Indiana-Illinois State line, and the nearest named community is 1,000 feet west of site R-101-4, at Efner, Ill., the correct name for this site would be "SITE R-101-4 AT EFNER, IL".

Latitude, longitude, aquifer type, or well depth are not to be used in the site name. This information is stored elsewhere in the Site File.

2. The person requesting the new site contacts the Site-File DBA and, together, they run a computer program (POLY.CPL) that retrieves nearby sites within a given radius of the proposed new site. All data in NWIS data bases for nearby sites are reviewed to determine if the proposed new site should be added to the Site File or if an appropriate (duplicate) site already exists. If a duplicate site is identified or suspected, the Site-File DBA will follow the procedure described in the "Duplicate Sites" subsection.
3. The person requesting establishment of the new site uses the Ground-Water Site Inventory System (GWSI) to enter all of the necessary Site-File data into NWIS under the supervision of the Site-File DBA. The person requesting establishment of the new site runs the EDIT GWDATA program (MAIN MENU OPTION 3 of GWSI) to check the entry and correct any identified errors. The Site-File DBA updates the Site File.
4. Approved new sites and related information are plotted in ink on the Master Site-File topographic maps. Plotting is performed by the person requesting

establishment of the site and is under the supervision of the Site-File DBA. Sites are plotted using the following format:

- (a) Open symbols (about 1/8 inch in size) are used.
- (b) Wells are plotted with circles.
- (c) Springs are plotted with a circle having a tilde (o~).
- (d) Lakes are plotted with squares.
- (e) Stream and river sites are plotted with triangles.
- (f) Meteorological sites are plotted with X's.

Once the symbol is plotted, a map-sequence number is plotted to the upper right of the symbol (the map-sequence number is not related to the site ID-sequence number). For example, if four sites are already on the topographic map and a new site is added, the map-sequence number for the new site is 5. In the margin of the topographic map, neatly print the following information:

- (a) Map-sequence number.
- (b) Site ID (5-character agency code followed by 8- or 15-digit site number).
- (c) Station name (exactly as it appears in the Site File).
- (d) Site type (with the following abbreviations: GW, ground water other than spring; SP, spring; LK, lake; SW, stream; SS, specific source; or ME, meteorological).
- (e) Project number (9-digit number: 4418 followed by the 5-digit project number).
- (f) The date the site was plotted on the Master Site-File topographic map (format: MM-DD-YYYY).
- (g) The initials of the person plotting the site.

## **Duplicate Sites**

If a duplicate site is identified or suspected, the Site-File DBA, the person requesting establishment of the new site, the Project Chief, and the Discipline Specialists (DS) must decide

1. if the old existing site should be used,
2. if a new site should be established,
3. if the old site should be deleted, and
4. if any existing data contained in NWIS should be merged into the new site.

This is a group responsibility.

Old sites commonly are poorly located and the data are incomplete or uncertain. All NWIS data bases should be inventoried to identify existing data stored under a known or suspected duplicate site ID. The person requesting establishment of the new site and the Site-File DBA must attempt to verify the location of the old site and associated data by checking all USGS reports, old project paper files, ground-water quality 3x5 cards in the District library, and the County ground-water reports prepared in cooperation with the Indiana Department of Conservation, Division of Water Resources. Information about the site in question should be solicited from all District employees. If the old site and data cannot be verified and if a new site must be established, the value of retaining the old site and data needs to be determined. Factors to consider include the amount, age, source agency, types, and quality of the data.

## **Site Changes and Deletions**

If data are to be merged from an old site to a new site, or otherwise changed or combined, notice must be given to all District employees. If a decision is made to delete a site, the intention to do so must be announced to all District personnel by the Site-File DBA, and an appropriate time given for a response. If a site or data are deleted because of a lack of confidence in or an inability to verify the data, paper copies of the Site-File

information and related NWIS data will be printed and filed by the old site ID in the District library. This is the responsibility of the Site-File DBA and the person requesting establishment of the new site.

Any changes to the site ID, the site name, or any data stored in the Site File must be noted in the computer file, "SITEFILE.CHANGES.LOG" that is maintained by the Site-File DBA. This file contains the old site ID; the new site ID; the nature and date of the change; the person requesting the change; the reason for the change (for example, "DUPLICATE SITE OF USGS 42424087564301"); and what, if any, data were merged (sample dates, record numbers).

Water-quality data moved to a new site or otherwise combined should state the original site ID in the remarks field of the WATER-QUALITY RECORD HEADER. Annotations also should be made to the paper files. This is the responsibility of the Water-Quality System (QWDATA) DBA. Site-File information moved or combined should be noted in the Remarks Record of the MISCELLANEOUS FILE in GWSI. Annotations also should be made to the paper files. This is the responsibility of the Site-File DBA.

If an old site can be verified from reports, District library paper files, or any other means previously discussed, the Site File of the old site must be updated to the maximum extent possible. The source of the verification and the name of the person who made the verification should be entered in the Remarks Record of the MISCELLANEOUS FILE in GWSI. This is the responsibility of the Site-File DBA. Water-quality records that can be verified should be updated to the maximum extent possible. Updating must include the Water Data Storage and Retrieval System (WATSTORE) parameter code 00029 with the correct 5-digit project number. The source of the verification and the initials of the person who made the verification must be added to the remarks field of the WATER QUALITY RECORD HEADER. This is the responsibility of the QWDATA DBA.

Finally, the site must be plotted on the Master Site-File topographic maps. This is the responsibility of the Site-File DBA.

## Recording Field Notes

Data collection usually requires the use of standardized field forms. The field form, which is usually formatted to meet the needs of the project, must reflect data-base requirements and the needs of other potential users of the data. The field form must include information pertinent to site location and condition, persons performing the field work, project number, reason the field work was performed, weather, instruments, procedures and methods, types of data collected, data-base parameter codes, and the times associated with various activities. Some examples include: Hydrolab<sup>1</sup> unit number; time of last calibration; type of sampler; sampling method; beginning, end, and midpoint time of sample collection; type of pump used; purging criteria; location of measuring point; and chemical preservatives and their order of use. Examples of District field forms are stored in the directory QW.TYPES>FORMS. It is the responsibility of the Project Chief to develop appropriate field forms. To ensure that field forms meet minimum requirements, field forms must be approved by the DS in consultation with the DBA's.

## Maintenance of Paper Files

While a project is active, the paper files for each data-collection site are maintained in Site-File folders in the office of the Project Chief or the project staff. It is the responsibility of the Project Chief to ensure that the Site-File folders contain all the information necessary to verify data in a report or NWIS data base. Data to be stored in Site-File folders include, if applicable:

1. Photocopy of a topographic map showing site location and topographic map name.
2. Description of the site, how to access it, and any related safety information.
3. Dated printout of Site-File information.
4. Original field notes or photocopy of original field notes.
5. Driller's log, geophysical logs, and well construction information.
6. Photographs of the site, surrounding land use, equipment, bench marks, measuring points.
7. Copies of analytical services request forms (laboratory login sheets).
8. Water-quality related forms (field alkalinity, bacteria, biological oxygen demand).
9. Printouts of QWDATA updates (all copies, in chronological order, with most recent on top).
10. Water-quality sample rerun or verification requests, results, and interpretations.
11. Dated tables of all water-quality data (used for validating multiple water-quality samples).
12. Forms documenting permission to sample (WRD memo 90.34).
13. Forms documenting permission to install wells, gages, or other monitoring equipment.
14. Water-level and discharge-measurement notes.
15. Level notes and computations, including information on the altitude of the land surface and a description of the measuring point and reference points.
16. Aquifer tests, slug tests, and other hydraulic information.
17. Dated printouts of primary computations.
18. Copies of all rating tables, datum corrections, and shift information.

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<sup>1</sup>Any use of trade, product, or firm names in this publication does not imply endorsement by the U.S. Government.

Any changes in data (for example, water-quality reruns, incorrectly located sites, math errors in levels or other calculations) are explained, dated, and initialed in the Site-File folders, and appropriate updates are made to NWIS data bases. It is the responsibility of the Project Chief to initiate changes to NWIS data bases, to provide the necessary data for updating to the DBA's, and to document changes made to NWIS data bases in the Site-File folders. After a project report has been approved for publication or (if no report is to be published) after a project has been completed or terminated, the Site-File folders will be archived in the District library (see "Archiving Paper Files and Project Files in the District Library" section).

### **Data Storage in National Water Information System Data Bases**

The following sections describe procedures for storing data in NWIS data bases. Four of the sections include lists of information that represent the minimum data elements required by the Indiana District for establishing sites and storing data in NWIS data bases. All entries to the Site File and GWSI ground-water data files are coded on form 9-1904-A, revised February 1987. It is the responsibility of the Project Chief and staff to compile and verify the required information. It is the responsibility of the DBA's, in consultation with the DS, to review and update these requirements periodically.

DBA's may allow exceptions from one or more required data elements on the basis of the unavailability of the data. For example, a person requesting establishment of a site for an observation well has a driller's log for the well, but the log contains no information on the method or hours of development—two data elements required for establishing a ground-water site. The GWSI DBA may except those two data elements and allow the site to be established without that information. Exceptions from required data will be made by the appropriate DBA on a case-by-case basis.

### **Site File**

Information required to be entered in the Site File for all data-collection sites is listed in table 1. Additional information required to be entered in the Site File for all ground-water sites is listed in table 2. All alphabetic information must be entered in CAPITAL letters. Each person requesting establishment of a site or storing data under an existing site must become familiar with these Site-File components (see Mathey, 1989, p. 2-8 to 2-38). It is the responsibility of the Project Chief to input and edit these data. It is the responsibility of the Site-File DBA to review and update these data.

### **Ground-Water Site Inventory System**

Information required to be entered in the GWSI ground-water data files for all ground-water sites is listed in table 3. All alphabetic information must be entered in CAPITAL letters. Each person requesting establishment of a ground-water site or storing data under an existing ground-water site must become familiar with these components in GWSI (see Mathey, 1989, p. 2-39 to 2-121). It is the responsibility of the Project Chief or the project staff to input and edit these data. It is the responsibility of the GWSI DBA to review and update these data.

### **Water-Quality System**

Information required to be entered in QWDATA for all water-quality samples is listed in table 4. These data can be obtained from a completed Analytical Services Request form from the National Water-Quality Laboratory. WATSTORE parameter codes required to be entered in QWDATA for all water-quality samples are listed in table 5. The quality-assurance remark code for all these parameter codes is "I" (USGS field value, in review). WATSTORE parameter codes required to be entered in QWDATA for all field alkalinity measurements are listed in table 6. Programs for calculating these alkalinity values are stored in the directory QW.TYPES>ALK.

**Table 1.** Information required to be entered in the Site File for all data-collection sites [FIPS, Federal Information Processing Standards]

Site-file component number	Brief description	Remarks
C4	Agency code	5-character code (example: IN003)
C1	Site number	8- or 15-digit number
C900	Station name	Include reference to nearest named community
C9	Latitude	
C10	Longitude	
C11	Latitude/longitude accuracy	
C6	District code	Indiana District = 18
C7	State code	Indiana = 18
C8	County code	3-digit FIPS county code
C5	Project number	9-digit number (example: 441813400)
C13	Land-net location	example: NWNWSES07T10NR06W
C14	Location map	Map name followed by Indiana District map number (example: MAYWOOD, IN 109C)
C15	Location map scale	
C16	Altitude of land surface or gage datum	In feet above sea level
C17	Method of altitude determination	
C18	Altitude accuracy	
C20	Hydrologic unit code	
C802	Site type	
C803	Agency use of site	
C804	Type of data collected	
C805	Type of instrumentation	
C806	Remarks	Must include name of USGS person establishing the site
C3	Data reliability	

**Table 2.** Additional information required to be entered in the Site File for all ground-water sites [WATSTORE, Water Data Storage and Retrieval System]

Site-file component number	Brief description	Remarks
C19	Topographic setting	
C2	Type of ground-water site	
C21	Date well constructed	
C23	Primary use of site	
C24	Primary use of water	
C713	Aquifer type	
C714	Aquifer code	8-character WATSTORE code
C28	Well depth	In feet below land surface
C27	Hole depth	In feet below land surface
C29	Source of depth data	
C30	Inventory water level	In feet below land surface
C31	Date of water-level measurement	
C34	Method of water-level measurement	
C37	Site status during water-level measurement	
C33	Source of water-level data	

**Table 3.** Information required to be entered in the Ground-Water Site Inventory System for all ground-water sites [WATSTORE, Water Data Storage and Retrieval System; GWSI, Ground-Water Site Inventory System]

<b>GWSI component number</b>	<b>Brief description</b>	<b>Remarks</b>
<b>CONSTRUCTION FILE</b>		
<b>Lift Record (required only if well is equipped with a pump)</b>		
C43	Type of lift	
C44	Depth to intake	In feet below land surface
C45	Type of power	
C268	Rated pump capacity	In gallons per minute
<b>Construction Record</b>		
C60	Date construction completed	
C63	Contractor's name	
C64	Source of construction data	
C65	Method of construction	
C66	Type of finish	
C67	Type of seal	
C68	Depth to bottom of seal	In feet below land surface
C69	Method of development	
C70	Hours of development	
C71	Special treatment	
<b>Hole Record</b>		
C73	Depth to top of interval	In feet below land surface
C74	Depth to bottom of interval	In feet below land surface
C75	Diameter of interval	In inches
<b>Casing Record</b>		
C77	Depth to top of casing	In feet below land surface
C78	Depth to bottom of casing	In feet below land surface
C79	Diameter of casing	In inches
C80	Casing material	
C81	Casing thickness	In inches

**Table 3.** Information required to be entered in the Ground-Water Site Inventory System for all ground-water sites--  
Continued

<b>GWSI component number</b>	<b>Brief description</b>	<b>Remarks</b>
<b>Openings Record</b>		
C83	Depth to top of opening	In feet below land surface
C84	Depth to bottom of opening	In feet below land surface
C87	Diameter of opening	In inches
C86	Opening material	
C85	Opening type	
C89	Opening length	In inches
C88	Opening width	In inches
<b>Repair Record</b>		
C166	Nature of repair	
C167	Date of repair	
C169	Name of contractor performing repair	
<b>Spring Record (required for springs only)</b>		
C172	Local name of spring	
C173	Type of spring	
C174	Permanence of spring	
<b>Measuring Point Record</b>		
C321	Begin date for measuring point	
C322	End date for measuring point	
C323	Height of measuring point	In feet above land surface
C324	Description of measuring point	Include altitude of measuring point in feet above sea level
<b><u>WATER-LEVEL FILE</u></b>		
C235	Water-level measurement date	
C709	Water-level measurement time	24-hour time (example: 1425)
C237	Water level	In feet below land surface
C238	Water-level measurement status	
C239	Water-level measurement method	
C276	Water-level measurement accuracy	

**Table 3.** Information required to be entered in the Ground-Water Site Inventory System for all ground-water sites--  
Continued

<b>GWSI component number</b>	<b>Brief description</b>	<b>Remarks</b>
<b><u>DISCHARGE FILE</u></b>		
C148	Date discharge measured	
C703	Type of discharge	
C150	Discharge	In gallons per minute
C151	Source of discharge data	
C152	Discharge measurement method	
C153	Production water level	In feet below land surface
C154	Static water level	In feet below land surface
C155	Source of water-level data	
C156	Water-level measurement method	
C157	Pumping period	In hours
C272	Specific capacity	In gallons per minute per foot of drawdown
<b><u>MISCELLANEOUS FILE</u></b>		
<b>Owner's Record</b>		
C159	Date of ownership	
C161	Owner's name	
<b>Geophysical Logs Record</b>		
C199	Type of geophysical log	
C200	Top of logged interval	In feet below land surface
C201	Bottom of logged interval	In feet below land surface
C202	Source of data	
<b>Cooperator's Data Record</b>		
C213	Cooperator's site identifier	
C218	Remarks	Include pertinent cooperator information

**Table 3.** Information required to be entered in the Ground-Water Site Inventory System for all ground-water sites--  
Continued

<b>GWSI component number</b>	<b>Brief description</b>	<b>Remarks</b>
<b>Remarks Record</b>		
C184	Remarks date	
C185	Remarks	Use to record person's name and reason for significant additions or changes to the Site-File or GWSI files
<b><u>GEOHYDROLOGIC LOGS FILE</u></b>		
<b>Geohydrologic Units Record</b>		
C91	Depth to top of unit	In feet below land surface
C92	Depth to bottom of unit	In feet below land surface
C93	Unit identifier	8-character WATSTORE code
C96	Lithology code	
C304	Contributing unit code	Identifies primary and secondary aquifers
C97	Lithologic modifier	
<b><u>HYDRAULICS FILE</u></b>		
C100	Hydraulic unit	8-character WATSTORE code
C101	Depth to top of interval	In feet below land surface
C102	Depth to bottom of interval	In feet below land surface
C103	Hydraulic unit type	
C104	Remarks	Include method of determination
C305	Source of data	
C107	Transmissivity	In feet squared per day
C108	Horizontal conductivity	In feet per day
C109	Vertical conductivity	In feet per day
C110	Storage coefficient	

**Table 4.** Information required to be entered in the Water-Quality System for all water-quality samples [WATSTORE, Water Data Storage and Retrieval System; FIPS, Federal Information Processing Standards]

Data	Remarks
Agency code	5-character code (example: IN003)
Site number	8- or 15-digit number
Project number	9-digit number (example: 441813400)
Sample year	
Sample month	
Sample day	
Sample time	24-hour time (example: 1435)
State code	Indiana = 18
District code	Indiana District = 18
County code	3-digit FIPS county code
Sample medium	
Geologic unit	For ground-water samples only, 8-character WATSTORE code
Analysis status	
Hydrologic condition	
Sample type	
Hydrologic event	

**Table 5.** Water Data Storage and Retrieval System parameter codes required to be entered in the Water-Quality System for all water-quality samples

Parameter code	Brief description	Remarks
00027	Collecting agency	
00028	Analyzing agency	
00029	Project number	5-digit code (example: 13400)
71999	Sample purpose	
82398	Sampling method	
84143	Well purging condition	For ground-water samples only
84144	Well selection criteria	For ground-water samples only
84146	Predominant land use within 100 feet of well	For ground-water samples only
84147	Predominant land use within 0.25 miles of well	For ground-water samples only
84148	Fraction of predominant land use within 0.25 miles of well	For ground-water samples only
84164	Sampler type	
72019	Depth to water	For ground-water samples only, in feet below land surface
00020	Air temperature	In degrees Celsius
00010	Water temperature	In degrees Celsius
00025	Barometric pressure	In millimeters of mercury
00003	Sampling depth	Depth of sampler intake, in feet below land surface or gage datum
99905	Person collecting sample	3-digit code in directory QW.TYPES>PARAMETER.CODE.99905/06
99906	Secondary person collecting sample	3-digit code in directory QW.TYPES>PARAMETER.CODE.99905/06

**Table 6.** Water Data Storage and Retrieval System parameter codes required to be entered in the Water-Quality System for all field alkalinity measurements

Parameter code	Brief description
<b>Non-Filtered Sample</b>	
00410	Fixed-end point alkalinity
00419	Incremental-end point alkalinity
00450	Bicarbonate
00447	Carbonate
<b>Filtered Sample</b>	
39036	Fixed-end point alkalinity
39086	Incremental-end point alkalinity
00453	Bicarbonate
00452	Carbonate

Each person submitting a water-quality sample must become familiar with the required information and WATSTORE parameter codes for storing data in QWDATA (see Maddy and others, 1989, p. 2-1 to 2-9 and appendixes A and B). It is the responsibility of the Project Chief to complete the Analytical Services Request form and to log-in each water-quality sample to QWDATA. It is the responsibility of the QWDATA DBA to review this data during or soon after sample login.

Under special circumstances, these data may be entered after a sample is logged in the computer. These circumstances include time required to analyze geologic and hydrologic data in order to determine geologic unit and aquifer type. The QWDATA DBA will not allow the Project Chief or staff access to the analytical results until all pertinent information has been entered in the computer. Project staff should be reminded of the need for prompt review of chemical analyses (especially nutrients). Any delay may compromise the validity and/or quality of the data.

### **Automated Data Processing System**

Additional information required to be entered in the Site File for sites with data to be stored in ADAPS is listed in table 7. Each person storing data in ADAPS must become familiar with these Site-File components (see Mathey, 1989, p. 2-23, 2-24, and 2-38).

Also, the ADAPS DBA must be provided with the following information in order to input, edit, and process data in ADAPS. Additional details and explanations for the required information below are described in Dempster (1990, p. 3-1 to 3-36).

1. The techniques used to obtain hydrologic measurements at the site. Techniques may range in complexity from direct human observation to sophisticated real-time satellite telemetry.
2. The hydrologic variable(s) being measured at the site. Some common variables include stream stage, stream velocity, precipitation, and selected water-quality parameters.
3. The type, make, and model number of all data-sensing equipment used at the site to record hydrologic data.
4. All test values, threshold values, time adjustments, and other exceedance limits for verification tests during data editing.
5. All rating tables, datum corrections, and shift information for use in primary computations.

It is the responsibility of the Project Chief to provide the requisite data to the ADAPS DBA. It is the responsibility of the ADAPS DBA to review and input these data into ADAPS.

### **Water-Use Data System**

The quality-assurance plan for the Indiana District's water-use program is described in Open-File Report 93-88 (Arvin, 1993). The water-use program is an ongoing effort to make Indiana water-use data available to water managers at the Federal, State, and local level. Each person collecting data to be stored in the Water-Use Data System (WUDS) is referred to pages 6-20 in Open-File Report 93-88, which describe procedures for the compilation and storage of data in WUDS.

**Table 7.** Additional information required to be entered in the Site File for sites with data to be stored in the Automated Data Processing System

<b>Site-File component number</b>	<b>Brief description</b>	<b>Remarks</b>
C813	Mean Greenwich time offset	Indiana District = -5
C814	Local standard time flag	Indiana District = NO
<b>For Lake and Stream Sites Only</b>		
C807	Base discharge	In cubic feet per second
C808	Drainage area	In square miles
C809	Contributing drainage area	In square miles
C810	Crest-stage gage upstream elevation	In feet above gage datum
C811	Crest-stage gage downstream elevation	In feet above gage datum
C812	Gage height of zero flow	In feet above gage datum

## **Comparison of Data in Field Notes, Laboratory Sheets, Data Bases, and Reports**

Laboratory printouts must receive timely review so that requests for reruns or verification of laboratory analyses can be performed. For example, nutrients must be rerun within a month from the date of collection. Discrepancies must be resolved, corrected if possible, and all actions documented in the Site-File folders and NWIS data bases. It is the responsibility of the Project Chief to ensure that all data have been plotted correctly on Master Site-File topographic maps; correctly recorded on laboratory sheets; and correctly entered into Site-File folders, data bases, and reports. Every report, whether published and in the public domain or administratively released, will contain the site ID's for all data-collection sites used in that report. Tables of water data must include WATSTORE parameter codes. Authors are required to publish their data—not just summary statistics. Senior authors of reports must ensure that the data in their reports are correct and can be verified by data in Site-File folders and NWIS data bases. The senior author is responsible for compiling an errata sheet with corrections for all errors contained in a report.

### **Archiving Paper Files and Project Files in the District Library**

At the conclusion of a project, the paper file for each data-collection site will be archived in the District library. Site-File folders will be filed by Federal Information Processing Standards (FIPS) county code, then by site ID within each particular FIPS county code. If a site has been used by two or more different projects, Site-File folders for each project are maintained in separate, but sequential, files. It is the responsibility of the

Project Chief to archive the Site-File folders. It is the responsibility of the Site-File DBA to ensure that Site-File folders have been properly archived and to resolve any filing or site-information problems. Data-organization and verification efforts during the project will ensure more rapid, efficient, and quality-assured responses to information requests.

Also, at the conclusion of a project, the project file maintained by the Project Chief will be archived in the District library. Project files archived in the District library will be no more than 4-in. thick and will be filed by project account number. The project files must contain the following information:

1. A copy of the project proposal.
2. Copies of all Management Information System reports, important correspondence, and all quarterly progress reports.
3. Multi-site data tables.
4. Important maps, model runs, and other interpretive information.
5. A copy of the final report(s) including errata.
6. A list of project personnel and their duties—especially with relation to installation of data-collection sites, data collection and management, and data analysis and report writing.
7. A compilation of all data-collection sites used in the project, with site ID's, and summary statements of the types of data collected at each site.

All remaining important project information will be archived in the warehouse in boxes labeled with the 9-digit project number, project name, date of project completion or termination, name of Project Chief, and a brief description of the contents. It is the responsibility of the Project Chief to organize and archive important project files in the District library and warehouse.

## **IMPLEMENTING AND ENFORCING THE DATA-MANAGEMENT POLICY AND PROCEDURES**

It is the responsibility of all personnel involved in the collection or compilation of hydrologic and related data to follow the procedures described in this document. It is the responsibility of the Section Chief(s) to ensure that Project Chiefs follow the procedures described in this document. Compliance with these procedures will be reviewed by the Section Chief(s) during quarterly project reviews and before the final project report is submitted for Director's approval. Section Chiefs should consult with DBA's and the DS during appraisal of the Data-Management Element of the employee's Performance Standards to help determine the degree to which an employee has complied with the District data-management procedures.

It is the responsibility of the DBA's to ensure that data added to the data base are complete and meet the requirements described in this document. It is the responsibility of the Site-File DBA to ensure that new data-collection sites are established according to the procedures described in this document. It is the responsibility of the DS to review and approve field forms, assess the need for additional types of information that must be documented and stored, and—in consultation with the DBA's—periodically review and revise the procedures in this document. Additional responsibilities have been described in the "Data-Management Procedures" section.

### **SUMMARY**

Data collected for hydrologic investigations in the Indiana District often have been documented, organized, and archived to meet the short-term needs of individual projects. This approach has contributed to many data-related problems: lost data, incorrect site ID's and site names, duplicate or triplicate Site-File or water-quality entries, greater effort required to retrieve data and to respond to information requests by the public,

and increased difficulty in verifying data stored in reports and in computer data bases. To address these problems, the Indiana District has adopted the policy that data collected for hydrologic investigations after Fiscal Year 1990 be documented, organized, and archived in a manner that (1) facilitates retrieval, evaluation, and use by District personnel and others; and (2) enables verification of data contained in all reports and computer data bases.

The following procedures have been established to meet the objectives of the District data-management policy:

1. New data-collection sites are properly established, named, and plotted. Procedures include detailed instructions for assigning site ID's and site names, plotting sites on District Master Site-File topographic maps, entering requisite data in the NWIS Site File, and identifying and eliminating duplicate sites and data. The Site-File DBA is responsible for ensuring that Project Chiefs and staff follow these procedures for establishing new sites.
2. Complete and clear field notes are made on standardized field forms. Data-elements to be included on field forms reflect data-base requirements and needs of other potential users. Field forms are developed by Project Chiefs and approved by the DS in consultation with DBA's.
3. Complete and well-organized Site-File folders are maintained for each data-collection site. Site-File folders include all information necessary to verify data in a report or NWIS data base. Any changes in data are explained, dated, and initialed in the Site-File folders, and appropriate updates are made to NWIS data bases. Project Chief and staff are responsible for properly maintaining and archiving Site-File folders and for initiating appropriate changes to NWIS data bases.

4. All relevant data are stored in appropriate NWIS data bases. This procedure includes tables of information required by the Indiana District to be entered in the Site File, GWSI ground-water data files, QWDATA, and ADAPS. The Project Chief is responsible for entering and editing the requisite data. DBA's are responsible for reviewing and updating these data.
5. Data are compared and verified among field notes, laboratory sheets, NWIS data bases, and reports. Project Chiefs are responsible for ensuring that data from these sources are internally consistent, and that all discrepancies are resolved and documented in the Site-File folders and appropriate NWIS data bases. Authors are required to publish their actual data (not just summary statistics). All reports must contain the site ID's of all data-collection sites referenced in the report, and all water-data tables must include WATSTORE parameter codes.
6. Site-File folders and project files are properly archived in the District library at the end of the project by the Project Chief. This procedure includes a list of information to be included in the project files. The Site-File DBA is responsible for ensuring that Site-File folders are archived properly and for resolving any filing or site-information problems.

It is the responsibility of all personnel involved in the collection or compilation of hydrologic and related data to follow District data-management procedures. Section Chiefs review compliance with these procedures during quarterly project reviews, before project reports are submitted for Director's approval, and during appraisal of the Data-Management Element of employees' performance standards.

Properly managed data will facilitate and improve the storage, retrieval, evaluation, quality assurance, and use of hydrologic and related data. As a result, data users can increase their productivity, and hydrologists and the public can have a higher degree of confidence in U.S. Geological Survey data and reports.

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