Kansas Hydrography Standard

August 1999

Kansas Hydrography Standards Working Group

Public Review

We welcome your comments and feedback on the Kansas Hydrography Standards. Please return your comments to state GIS clearinghouse at the following address (Data Access and Support Center, University of Kansas, 1930 Constant Avenue, Campus West, Lawrence, Kansas 66047), or submit your comments on the Kansas Hydrography Standards discussion forum at the clearinghouse, **http://gisdasc.kgs.ukans.edu/dasc/discussion/discussion.html**

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1. Introduction

1.1 Mission and Goals of the Kansas Hydrography Standard

This document provides a set of guidelines by which hydrographic information can be more uniformly developed, maintained and cartographically represented and, thereby, integrated with other geospatial data. Digital versions of these hydrographic features are the focus of this standard, but similar concepts of uniformity, currency, and completeness also apply to manual mapping efforts. These standards are important to assure users and developers that hydrography data files can be used independently or together.

The *"Standards for National Hydrography Dataset - High Resolution--DRAFT,"* served as the primary guidelines for the Kansas Hydrography Standard (KHS). The KHS will serve to enhance cooperative ventures for hydrographic development efforts among government and public interests at all levels. This standard will help ensure coordination in these development efforts for accuracy, reliability, accessibility, and efficiency.

The KHS adopts the Kansas GIS Vision Statement as follows:

To shape the growth of GIS through open communication, education, and cooperation in order to:

- *Optimize data accuracy, reliability, and accessibility*
- *Meet the needs of the technical and non-technical user community*
- *Support the decision-making process*

In coordination with other Kansas Geospatial Data Standards this document echoes the following objectives:

- *Create an attitude of cooperation*
- *Generate support at home*
- *Identify common interests*
- *Identify established guidelines for developing and maintaining standards*
- *Identify areas of need for standardization*
- *Identify obstacles and barriers to data sharing*
- *Avoid duplication in creating data*
- *Establish standardized metadata*
- *Ensure data security*
- *Create flexible standards*
- *Catalog existing data*
- *Build a larger community of technical and non-technical users*
- *Develop a geographic data framework for Kansas that is compatible with the framework of the National Spatial Data Infrastructure.*

1.2 Need for Standard

GIS data development, conversion, and maintenance represent significant investments. To ensure the best possible return on these investments, it makes economic sense to define standards to make this information useable by the widest possible audience. Useful data can be developed and shared by multiple data producers and users across the state.

1.3 Relationship to Existing Standards

The KHS is based upon existing GIS data development standards initiated by the efforts of federal standards work groups. In addition to federal efforts, the KHS has been written to integrate with other Kansas GIS Policy Board standards. Geospatial data standard documentation that was used to support the KHS includes (see Appendix B for complete citation):

Standards for National Hydrography Dataset - DRAFT
Standards for National Hydrography Dataset--High Resolution - Draft
National Hydrography Dataset, *DRAFT Reference Guide*
Kansas Geodata Compatibility Guidelines
Kansas Geospatial Metadata Standard
Draft - Kansas Geospatial Data Standards, Jurisdictional and Administrative Boundaries
Kansas GIS Cadastral Standards
Draft - Kansas Geospatial Data Addressing Standard

1.4 Description of Standard

This document is intended to promote data consistency between levels of government that produce, maintain and exchange hydrographic data. The KHS categorizes and defines specific hydrographic data types, cartographic representations, and feature attribution. In addition, the KHS addresses issues common among all digital GIS resources, such as encoding, quality control, data maintenance, and metadata. Refer to Appendix A, "Catalog of Kansas Hydrographic Features," for a listing of hydrographic features represented in the body of this document. The KHS is not intended to address all hydrographic data collection at the scales anticipated by local or private entities. However, this document can be used to establish guidelines for more refined features which may be appended to this document.

1.5 Applicability and Intended Uses of Standard

The KHS is intended to support the automation, integration, and sharing of publicly available hydrographic data. It is intended to be usable by all levels of government, as well as the private sector, to achieve consistency in the digital representation of hydrographic features. Further, the KHS will discuss conventional practices for developing new hydrographic datasets.

In preparing this document, care was taken to devise standards that are:

- Simple, easy to understand, and as logical as possible
- Uniformly applicable, whenever and wherever possible
- Flexible and able to accommodate future additions
- Dynamic in terms of continuous review

The Standard is not intended to be a substitute for an implementation design. An implementation design requires adapting the structure and form of these definitions to meet specific application requirements.

1.6 Standard Development Procedures

1.6.1 Participants

A core group of participants was involved in the development of this standard. A larger group of interested participants monitored the progress of the KHS and attended the work group sessions at the Standards Forums. The core group provided the substantive document that was reviewed by the broader group to provide community feedback.

The following persons have been involved in this work group:
Bader, Dan, Newton County Appraiser's office
Blackford, Susan *(special editor), U.S. Fish and Wildlife*
Cavner, Jeff, Kansas Department of Transportation
DeMoss, Pam,
Fletcher, Mike, Kansas Department of Transportation
Hager, Richard, U.S. Department of Agriculture
Hermreck, Deanna, Miami Co. Appraiser's office
Juracek, Kyle *(special editor), U.S. Geological Survey*
Miller, Richard D., Kansas Water Office
Mosher, Tom *(special editor), Kansas Wildlife and Parks*
Rinehart, Bob *(advisor on federal standards), U.S. Geological Survey*
Rome, Travis, U.S. Department of Agriculture, Natural Resources Conservation Service
Smith, Scott
Stewart, Aimee *(co-chair), Kansas Applied Remote Sensing*
Stullken, Lloyd *(co-chair), Kansas Department of Agriculture*
Thomas, A.J. *(special editor), Kansas Department of Health and Environment*
Williams, Susan *(special editor), Kansas Department of Revenue*
Wilson, Nancy, Douglas County Planning Department

1.6.2 Process

The form and content of the KHS was modeled on the *Kansas Geodata Compatibility Guidelines* template. From inception, it was expected that the standards developed for the National Hydrography Dataset (NHD) would be a large part of the Kansas Hydrography Standards. Draft versions of the applicable national standards were

reviewed with the aid of a U.S. Geological Survey (USGS) representative. The KHS expands on the national standard by focusing on local scales and customizing the feature list (Appendix A) for local needs. The KHS was developed to be scale-independent, assisting various GIS data development activities, so that the resulting hydrography datasets could be aggregated across political boundaries or joined with other conforming datasets.

1.6.3 Comments and Reviews

Late February, 1998 -- recruitment of Work Group members from as many different sectors within the GIS community as possible.
March 26, 1998 -- Standards Forum in Wichita - break-out session. Review of federal standards and skeleton outline presented for study. Group determined that the goals for the project should be:

1) comprehensive, yet flexible guidelines using or adapting existing documents and guidelines where available and appropriate
2) standards that will produce data suitable for NHD inclusion.

June 2, 1998 -- Editorial group - Outline and list features discussed.
July 20, 1998 -- Editorial group - List of features revised for Standards Forum discussion, skeleton outline presented as partially annotated by Stewart and Thomas.
August 27, 1998 -- Standards Forum in Wichita - Consensus on features was attained.
October 8, 1998 -- Editorial group - Textual review of the partially-annotated standard begun. Appendix A added to text.
November 5, 1998 -- Editorial group - Move forward on textual review.
December 10, 1998 -- Editorial group - Move forward on textual review.
January 21, 1999 --Editorial group - Provide final input to draft.
February 9, 1999 -- Present draft to GIS Community (at EXPO) for comments
March 25, 1999 --Editorial group - Move forward on textual review.
May 13, 1999 -- Editorial group - Move forward on textual review.
August 19, 1999 -- Submission of KHS to GIS community for approval.

1.7 Maintenance of Standard

An ongoing maintenance process that may result in updates to meet user needs and to integrate future standards is necessary. It is expected that maintenance responsibilities will be shared by federal, state, and local agencies in compliance with the guidelines established by the Kansas GIS Policy Board.

2. Body of the Kansas Hydrography Standard

2.1 Technical/Operational context

2.1.1 Data Accessibility and Maintenance

Certain custodial responsibilities are inherent with the development of digital spatial datasets regarding data access and maintenance. A spatial data developer has the responsibility to store and maintain the data files making them available to potential users through electronic media in common exchange formats. A developer also assumes the responsibility to define the data content in a standardized metadata format. Data developers should expect to archive a copy of metadata documents with the state's Data Access and Support Center (DASC--see reference in Appendix B) to minimize duplicative spatial data development efforts, encourage consistent data conversion standards, enhance spatial data access, and provide notice of available GIS data.

2.1.2 Reference systems

To support data exchange, all data must carry documentation for the coordinate reference system, projection, datum, and units of measure. Recommendations for reference systems can be acquired from the state GIS clearinghouse, DASC. Where applicable, the most current horizontal and vertical datums should be used. The Kansas Geospatial Metadata Standard documents the form and content for reporting reference information.

2.1.3 Global Positioning System

Global positioning system (GPS) technology can significantly enhance the spatial accuracy of field data collection and geospatial data development. Metadata documentation on GPS equipment, procedures, and processing is recommended to support data exchange and archival for geospatial datasets generated from GPS data. U.S. Environmental Protection Agency (EPA)'s Method Accuracy Database (MAD) structure illustrates the battery of information recommended to document GPS location information. At a minimum, geospatial developers should report the following information, if employing GPS collection techniques:

Type and accuracy of GPS unit
Collection date
Collection method
Feature description
Coordinates
Reference system
Datum

2.1.4 Integration of Themes

The federal agencies, USGS and EPA, have established a precedence for cooperative spatial data development with the establishment of the NHD. The standards used to produce the NHD form the basis for this document. It is recommended that where applicable local and state efforts to improve hydrographic data be compatible with this national-level data development effort. The data structure of the NHD encompasses a wide range of point, line, and polygon hydrographic features. Appendix A, Catalog of Kansas Hydrographic Features, references a subset of these data elements applicable to the KHS. Alteration or exceptions to these basic theme components should be referenced in metadata documentation and addressed through a data standard revision process referenced in Section 1.7.

2.1.5 Encoding

Encoding, as addressed in this section, deals with how physical or map features are converted or digitized into a digital form. Vector and raster are two data structures used to represent spatial data in a digital file.

A vector data structure is a collection of digital graphic elements (points, lines and polygons) that represent the shape of surface features. Descriptive information for each feature (attributes) is usually recorded in a related database table. Vector data structures are regularly used to represent linear datasets, such as hydrography, to take advantage of the finer positional resolutions possible with this file format.

A raster data structure uses a grid system to characterize surface features. Each cell in the grid represents a prescribed surface area. Raster data structures are often used to represent continuous surface features, such as temperature or elevation, each file describing one surface characteristic.

Encoding or digitizing controls such as minimum mapping units, scale generalization, ground control, and graphic or cell resolution affect the accuracy of the spatial dataset. Tested and reliable encoding controls are necessary to ensure quality representation of surface features in either a vector or a raster data structure. For encoding examples or suggestions, data developers can review existing spatial metadata at the state GIS clearinghouse, then establish their own quality controls and metadata documentation.

Topology is defined as the spatial relationship between connecting or adjacent spatial features. The accuracy and reliability of the vector or raster data structure topology is impacted by the encoding controls used to develop the digital spatial data. Topological relationships in a hydrographic dataset are required to model flow and network patterns. To support modeling functions, two hydrographic parameters to be addressed during the encoding process are flow direction and connectivity. Flow represents the direction of water drainage through the

hydrographic network. Connectivity or adjacency refers to the relationship between stream segments to maintain a hydrographic network.

2.1.6 Resolution

In general practice, mapped data are collected in a number of map resolutions (scales). Data collected at higher resolutions can reduce data duplication, since, with the advent of digital geospatial data, lower resolution data can be extracted from data collected at a higher resolution. The resolution or scale at which data are collected is an important piece of development documentation that must be referenced in the metadata. Resolution information for each data theme must also be annotated to facilitate comparison and aggregation of datasets produced from different sources.

2.1.7 Accuracy

The attribute accuracy and the spatial accuracy of geospatial data must be documented in the metadata accompanying the geospatial dataset. Metadata elements relating to accuracy are referenced in the Kansas Geospatial Metadata Standard. Another reference source for data accuracy on GPS source information is the EPA MAD file structure (see Section 2.1.3).

Attribute accuracy addresses the quality and extent of the information assembled to describe the surface features. Acceptable field values, quality assurance statements, and tolerance factors define the type of applications for which data can be used or additional data collection is warranted. Spatial accuracy is specific to the encoding method employed to derive digital information from source documents or the geodetic controls used to orient the surface features to real world coordinates. Absolute accuracy reflects how well the geospatial dataset represents surface features and should comply, where applicable, with the National Standard for Spatial Data Accuracy developed by the Federal Geographic Data Committee (June, 1998). Relative accuracy qualifies the positional integrity between and among surface features. Affected by the level of absolute accuracy, relative accuracy is also influenced by projection distortion. (Note: the National Standard for Spatial Data Accuracy (NSSDA) developed by the Federal Geographic Data Committee (June, 1998) has superceded the National Map Accuracy Standard established by the U.S. Office of Budget in 1947. As of publication date for this standard, USGS has not yet implemented the NSSDA within their products and still references the National Map Accuracy Standard.)

2.1.8 Edge Matching

As implied by the term, edge matching is the process of matching continuous spatial features across a contiguous spatial dataset tiling scheme. River and stream channels extending across tile boundaries are examples of continuous spatial features, whereas an example of a spatial dataset tiling scheme is the 7.5-minute USGS quadrangle boundaries. Continuous or topologically networked

hydrographic data are required for many forms of hydrologic modeling and analysis, making edge matching a critical aspect of geospatial data development.

The quality of the edge matching process is affected by the accuracy and encoding standards established for the geospatial dataset being joined together. Quality control tolerances for edge matching should be consistent with the absolute and relative accuracies established for the geospatial dataset (see Section 2.1.7). Exceptions or variances, if any, to these tolerance factors should be noted in a metadata document.

2.1.9 Feature Identification

A feature is a real world phenomenon that is whole and not divisible into phenomena of the same kind. Basic features are unique and not made up of other features. Basic features are grouped as points, lines, and polygons. Compound features are composed of basic features. See Appendix A for feature examples.

Each feature, either basic or compound, should be uniquely identified. Federal or state identification systems currently exist to describe or track features. The use of existing or complementary identification systems is a fundamental concept of standards development to provide a link among spatial and tabular datasets. Where possible, the use of existing identification systems or the development of logical extensions is recommended. At present, a review of the state GIS core databases, housed at the state GIS clearinghouse, will help identify contact names to query about feature identification systems. It is the responsibility of the developer to either seek out existing identification or develop identification systems for their data development efforts.

2.1.10 Attributes

Attributes describing hydrographic features provide essential data to the user community. The features and attributes referenced in Appendix A describe Kansas hydrography. The attributes for these features should, at a minimum, include a statement regarding how accurately this information represents the hydrographic features in terms of completeness, logical consistency, and currency. It is recommended that this qualifying information be recorded in the Kansas metadata (Section: Entity and Attribute Information, Subsection: Attribute, Attribute Definition) that accompanies the GIS dataset. See Section 2.1.7 for details on attribute accuracy.

The NHD includes a national-level hydrographic feature list. Data developers may use codes from this list or coordinate with the standards custodian for new codes to describe unique hydrographic attributes. The KHS and NHD standards resources will help support consistency and facilitate data exchange among local geospatial dataset development efforts. Until the NHD is complete, it is recommended that database developers review existing data development efforts

to ascertain the availability of generally accepted feature attribute schemes for use in local projects.

2.1.11 Transactional Updating

A transactional history of dataset changes is an important concept to support data distribution within the user community. Maintenance of transactional processes is the responsibility of the data developer. Documenting changes to a feature delineation or attribution builds data reliability. The data developer is also responsible for establishing an update cycle, whether contingent upon available funding or part of a regular maintenance schedule. This schedule, along with the last revision date, becomes part of the metadata documentation accompanying the data.

It is recognized that documentation to substantiate changes on feature shapes or attributes can become too burdensome for even the most sophisticated information systems. Basic guidelines should be established by the data developer for the following aspects of transactional updating: date of change; identification of full or partial change; type of change, either shape or attribute; purpose for change; identification tag to link original and revised data; entity and person(s) requesting the change.

2.1.12 Records management

By its very nature, a hydrologic system is in a constant state of flux, and correspondingly, so is the geospatial dataset representing that natural system. While transaction updating records changes to the natural system or the characteristics of that natural system, record management addresses changes in the constructs used to organize and maintain the geospatial database. Regularly scheduled archives help ensure data continuity as changes occur to database constructs such as file structures, identification schemes, transaction functions, file categories or naming conventions. Historical records management is critical during the formative development of a spatial dataset and is a routine aspect of continued data maintenance. Data developers should anticipate requests for historical versions of their data and retain archive copies that can be made available upon request.

2.1.13 Metadata

Metadata summarize the development history, data content, maintenance process, accuracy statements and applicable use of a spatial dataset. Metadata completed for hydrographic datasets should comply with the Kansas Geospatial Metadata Standard and be maintained and updated by the data developer. These metadata will be distributed to the state GIS clearinghouse to be included in the National Geospatial Data Clearinghouse.

2.2 Data Characteristics

A subset of hydrographic features for Kansas hydrography has been excerpted from the USGS resource, *"Standards for National Hydrography Dataset - High Resolution--DRAFT,"* and has been made a part of this standards document (see Appendix A). A unique aspect of this resource is the representation rules statement ("Capture feature as...") accompanying numerous features. Applying the representation rules, a user can determine whether the hydrographic feature in question should be represented as a point, line, or polygon, depending upon the scale of the resource being used to produce the geospatial dataset. Being scale independent, this reference guide can be used by everyone regardless of areal resolution or GIS data format.

2.2.1. Minimum Hydrographic Geospatial Features

See Appendix A, "Catalog of Kansas Hydrographic Features"

2.2.2. Minimum Hydrographic Attributes

Minimum attributes include:

- Unique alphanumeric identifier
- Feature type (selected from Appendix A)
- Date
- Name (principal, secondary, tertiary names with reference to Geographic Names Information System (GNIS))

2.2.3. Optional Hydrographic Geospatial Features

Hydrographic features described in USGS, "*Standards for National Hydrography Dataset - High Resolution--DRAFT*"

Hydrographic features described in NHD.

2.2.4. Optional Hydrographic Attribute Elements

Optional attributes can reflect unique local conditions or requirements. Suggestions for optional attributes can be drawn from examples in the NHD.

Appendix A

Catalog of Kansas Hydrographic Features

Feature code definitions listed alphabetically by feature type. Feature definitions and codes are excerpted from the Draft Reference Guide of the National Hydrography Dataset with deletions and additions by KHS committee.

Feature Type FCODE Description
*** indicates Kansas addition**

ANCHORAGE - An area where a vessel anchors or may anchor, either because of suitability or designation.
Capture feature as a point if shortest axis less than .025" on source map and as polygon if greater.

Anchorage	30200	feature type only: no attributes
Anchorage	30201	Anchorage Type | explosives isolation
Anchorage	30202	Anchorage Type | quarantine
Anchorage	30203	Anchorage Type | seaplane

AREA OF COMPLEX CHANNELS - An area where a stream or river flow in an intricate network of interlacing channels.
Capture feature as a polygon if identifiable on source map.

Area of Complex Channels	53700	feature type only: no attributes

AREA TO BE SUBMERGED - The known extent of the intended lake that will be created behind a dam under construction.
Capture feature as a polygon if identifiable on source map.

Area to be submerged	30700	feature type only: no attributes

***ARROYO -** see Wash

ARTIFICIAL PATH - An abstraction to facilitate modeling through open water bodies and to act as a surrogate for lakes and other water bodies.
Capture feature as a point when headwaters of a drainage is a lake or pond and as a line if identifiable on source map.

Artificial Path	55800	feature type only: no attributes

BAY/INLET - A water area that is an opening of an estuary, lake, or river into its shore.
Capture feature as a polygon if identifiable on source map.

Bay/inlet	31200	feature type only: no attributes

BRIDGE - A structure spanning and providing passage over a waterway, railroad, or other obstacle.
Capture feature as a point if shortest axis less than .025" on source map, as a line if width is less than 0.0625", and as polygon if width is greater than 0.0625".

Bridge	31800	feature type only: no attributes

CANAL/DITCH - An artificial open waterway constructed to transport water, to irrigate or drain land, to connect two or mores bodies of water, or to serve as a waterway for water craft.
Capture feature as line if shortest axis is less than .025" on source map and as polygon if greater.

Canal/Ditch	33600	feature type only: no attributes
Canal/Ditch	33601	Canal/Ditch Type | aqueduct
Canal/Ditch	33602	Canal/Ditch Type | unspecified

CONNECTOR - A known, but nonspecific, connection between two non-adjacent network segments.
Capture feature as a line if identifiable on source map.

Connector	33400	feature type only: no attributes

*Culvert

*__CREEK__ - see Stream/River

DAM/WEIR - A barrier constructed to control the flow or raise the level of water.
Capture feature as line if shortest axis is less than .02" on source map and as polygon if greater.

Dam/Weir	34300	feature type only: no attributes
Dam/Weir	34301	Construction Material | earthen; Operational Status | operational
Dam/Weir	34302	Construction Material | earthen; Operational Status | under construction
Dam/Weir	34303	Construction Material | nonearthen; Operational Status | operational
Dam/Weir	34304	Construction Material | nonearthen; Operational Status | under construction

FLUME - An open, inclined, artificial channel constructed of wood, metal, or concrete; generally elevated.
Capture feature as line if less than .025" on source map and as polygon if greater.

Flume	36200	feature type only: no attributes

GAGING STATION - A structure used to measure the characteristics of a hydrographic feature.
Capture feature as a point if identifiable on source map.

Gaging Station	36700	feature type only: no attributes

GATE - A structure that may be swung, drawn, or lowered to block an entrance or passageway.
*Capture feature as a point if shortest axis less than .025" on source map and as polygon if greater.

Gate	36900	feature type only: no attributes
Gate	36901	Gate Type | drydock
Gate	36902	Gate Type | floodgate
Gate	36903	Gate Type | lock
Gate	36904	Gate Type | tidegate
Gate	36905	Gate Type | unspecified

*__GRASSED WATERWAY__ - An artificial conveyance for storm runoff protected from erosion by grassy turf.
Capture feature as a line if shortest axis less than .025" on source map and as polygon if greater.

HAZARD ZONE - An area identified as a danger to maritime navigation.
Capture feature as a polygon if identifiable on source map.

Hazard Zone	37300	feature type only: no attributes
Hazard Zone	37301	Hazard Zone Category | unspecified
Hazard Zone	37302	Hazard Zone Category | crib area
Hazard Zone	37303	Hazard Zone Category | foul ground
Hazard Zone	37304	Hazard Zone Category | mine danger area
Hazard Zone	37305	Hazard Zone Category | piling area
Hazard Zone	37306	Hazard Zone Category | platform area
Hazard Zone	37307	Hazard Zone Category | reef area
Hazard Zone	37308	Hazard Zone Category | rock area
Hazard Zone	37309	Hazard Zone Category | shoal
Hazard Zone	37310	Hazard Zone Category | snag/stump area
Hazard Zone	37311	Hazard Zone Category | well area
Hazard Zone	37312	Hazard Zone Category | wreckage

INUNDATION AREA - An area of land subject to flooding.
Capture feature as a polygon if identifiable on source map.

Inundation Area	40300	feature type only: no attributes
Inundation Area	40301	Inundation Control Status | controlled; Inundation Area Type | debris basin
Inundation Area	40302	Inundation Control Status | controlled; Inundation Area Type | dewatering area
Inundation Area	40303	Inundation Control Status | controlled; Inundation Area Type | duck pond
Inundation Area	40304	Inundation Control Status | controlled; Inundation Area Type | general case
Inundation Area	40305	Inundation Control Status | controlled; Inundation Area Type | percolation basin
Inundation Area	40306	Inundation Control Status | controlled; Inundation Area Type | retarding basin
Inundation Area	40307	Inundation Control Status | not controlled

LAKE/POND - A standing body of water with a predominantly natural shoreline surrounded by land. (* Feature class includes pools associated with strip mining and quarries.)
Capture feature as a point if shortest axis less than .025" on source map and as polygon if greater.

Lake/Pond	39000	feature type only: no attributes
Lake/Pond	39001	Hydrographic Category | intermittent; Water Characteristics | salt
Lake/Pond	39002	Hydrographic Category | intermittent; Water Characteristics | unspecified
Lake/Pond	39003	Hydrographic Category | perennial; Water Characteristics | salt
Lake/Pond	39004	Hydrographic Category | perennial; Water Characteristics | unspecified

***LEVEE** - A raised linear mound of earth, gravel, or similar material built to prevent flooding, or to control or confine the flow of liquids.

***NICKPOINT** - see Waterfall

NONEARTHEN SHORE - A structure build of stone, brick, concrete, or other building materials that borders a body of water.
Capture feature as a line if identifiable on source map.
Nonearthen Shore 41100 feature type only: no attributes

PIPELINE - A closed conduit, with pumps, valves and control devices, for conveying fluids, gases, or finely divided solids.
Capture feature as a line if identifiable on source map.

Pipeline	42800	feature type only: no attributes
Pipeline	42801	Product | water; Pipeline Type | aqueduct; Relationship to Surface | at or near
Pipeline	42802	Product | water; Pipeline Type | aqueduct; Relationship to Surface | elevated
Pipeline	42803	Product | water; Pipeline Type | aqueduct; Relationship to Surface | underground
Pipeline	42804	Product | water; Pipeline Type | aqueduct; Relationship to Surface | underwater
Pipeline	42805	Product | water; Pipeline Type | general case; Relationship to Surface | at or near
Pipeline	42806	Product | water; Pipeline Type | general case; Relationship to Surface | elevated
Pipeline	42807	Product | water; Pipeline Type | general case; Relationship to Surface | underground
Pipeline	42808	Product | water; Pipeline Type | general case; Relationship to Surface | underwater
Pipeline	42809	Product | water; Pipeline Type | penstock; Relationship to Surface | at or near
Pipeline	42810	Product | water; Pipeline Type | penstock; Relationship to Surface | elevated
Pipeline	42811	Product | water; Pipeline Type | penstock; Relationship to Surface | underground
Pipeline	42812	Product | water; Pipeline Type | penstock; Relationship to Surface | underwater
Pipeline	42813	Product | water; Pipeline Type | siphon; Relationship to Surface | unspecified

PLAYA - The flat area at the lowest part of an undrained desert basin, generally devoid of vegetation.
Capture feature as a polygon if identifiable on source map.
Playa 36100 feature type only: no attributes

POST - An upright piece of timber or other material, in or adjacent to a body of water, used for mooring ships or supporting other structures.
Capture feature as a point if identifiable on source map.

Post	42200	feature type only: no attributes
Post	42201	Post Type | dolphin
Post	42202	Post Type | piling

***POOL** - see Stream/River or Lake/Pond

RAPIDS - An area of swift current in a stream or river, characterized by standing waves or by boulders and rocks.

Rapids	43100	feature type only: no attributes

REACH - A segment of surface water having a unique identifier used to designate or track a group of physical features, i.e. artificial path, river/stream, or levee, as a unit.

RESERVOIR - A constructed basin formed to contain water or other liquids.
Capture feature as a point if shortest axis less than .03" on source map and as polygon if greater.

Reservoir	43600	feature type only: no attributes
Reservoir	43601	Reservoir Type | aquaculture; Construction Material | unspecified
Reservoir	43602	Reservoir Type | decorative pool; Construction Material | nonearthen
Reservoir	43603	Reservoir Type | decorative pool; Construction Material | unspecified
Reservoir	43604	Reservoir Type | disposal-tailings pond; Construction Material | earthen
Reservoir	43605	Reservoir Type | disposal-tailings pond; Construction Material | unspecified
Reservoir	43606	Reservoir Type | disposal-unspecified; Construction Material | unspecified
Reservoir	43607	Reservoir Type | evaporator; Construction Material | unspecified
Reservoir	43608	Reservoir Type | swimming pool; Construction Material | nonearthen
Reservoir	43609	Reservoir Type | treatment-cooling pond; Construction Material | unspecified
Reservoir	43610	Reservoir Type | treatment-filtration pond; Construction Material | unspecified
Reservoir	43611	Reservoir Type | treatment-settling pond; Construction Material | unspecified
Reservoir	43612	Reservoir Type | treatment-sewage treatment pond; Construction Material | unspecified
Reservoir	43613	Reservoir Type | water storage; Construction Material | nonearthen; Cover Status | covered; Hydrographic Category | unspecified
Reservoir	43614	Reservoir Type | water storage; Construction Material | earthen; Cover status | not covered; Hydrographic Category | intermittent
Reservoir	43615	Reservoir Type | water storage; Construction Material | earthen; Cover status | not covered; Hydrographic Category | perennial
Reservoir	43616	Reservoir Type | water storage; Construction Material | nonearthen; Cover status | not covered; Hydrographic Category | unspecified
Reservoir	43617	Reservoir Type | water storage; Construction Material | unspecified; Cover status | unspecified; Hydrographic Category | unspecified
Reservoir	43618	Reservoir Type | unspecified; Construction Material | earthen
Reservoir	43619	Reservoir Type | unspecified; Construction Material | nonearthen
Reservoir	43620	Reservoir Type | unspecified; Construction Material | unspecified

***RIFFLE** - see Stream/River

ROCK - A concreted mass of stony material.
Capture feature as a point if identifiable on source map.

Rock	44100	feature type only: no attributes
Rock	44101	Relationship to Surface | above water
Rock	44102	Relationship to Surface | underwater

***RUN** - see Stream/River

SHORELINE - A naturally occurring line of contact between a body of water and the land.
Capture feature as a line if identifiable on source map.

SINK/RISE - The place at which a stream disappears underground or reappears at the surface in a karst area.
Capture feature as a point if shortest axis less than .025" on source map and as polygon if greater.

Sink/Rise	45000	feature type only: no attributes

SNAG/STUMP - A firmly attached stem or trunk of a tree near the surface of water.
Capture feature as a point if identifiable on source map.

Snag/Stump	45200	feature type only: no attributes
Snag/Stump	45201	Snag/Stump Type | snag; Relationship to Surface | above water
Snag/Stump	45202	Snag/Stump Type | snag; Relationship to Surface | underwater
Snag/Stump	45203	Snag/Stump Type | stump; Relationship to Surface | above water
Snag/Stump	45204	Snag/Stump Type | stump; Relationship to Surface | underwater

SPECIAL USE ZONE - An area where distinctive types of maritime activities occur.
Capture feature as a polygon if identifiable on source map.

Special Use Zone	45400	feature type only: no attributes
Special Use Zone	45401	Special Use Zone Type | dump area; Operational Status | operational
Special Use Zone	45402	Special Use Zone Type | dump area; Operational Status | abandoned
Special Use Zone	45403	Special Use Zone Type | spoil area; Operational Status | operational
Special Use Zone	45404	Special Use Zone Type | spoil area; Operational Status | abandoned

SPECIAL USE ZONE LIMIT - The limit of an area used for distinctive types of maritime activities.
Capture feature as a line if identifiable on source map.

Special Use Zone limit	53300	feature type only: no attributes
Special Use Zone limit	53301	Positional Accuracy | definite
Special Use Zone limit	53302	Positional Accuracy | indefinite

SPILLWAY - A constructed passage for surplus water to run over or around a dam.
Capture feature as a polygon if identifiable on source map.

Spillway	45500	feature type only: no attributes

SPRING/SEEP - A place where water issues from the ground naturally.
Capture feature as a point if identifiable on source map.

Spring/Seep	45800	feature type only: no attributes
Spring/Seep	45801	Water Characteristics | unspecified
Spring/Seep	45802	Water Characteristics | alkaline
Spring/Seep	45803	Water Characteristics | hot
Spring/Seep	45804	Water Characteristics | sulphur

STREAM/RIVER - A body of flowing water. * Also referenced as Creek, Riffle, Run, Pool.
Capture feature as line if less than .025" on source map and as polygon if greater.

Stream/River	46000	feature type only: no attributes
Stream/River	46001	Hydrographic Category | intermittent; Positional Accuracy | definite
Stream/River	46002	Hydrographic Category | intermittent; Positional Accuracy | indefinite
Stream/River	46003	Hydrographic Category | intermittent; Positional Accuracy | not applicable
Stream/River	46004	Hydrographic Category | perennial; Positional Accuracy | definite
Stream/River	46005	Hydrographic Category | perennial; Positional Accuracy | indefinite
Stream/River	46006	Hydrographic Category | perennial; Positional Accuracy | not applicable

SUBMERGED STREAM - An old river course inundated by an impounded water body.
*Capture feature as a line if shortest axis less than .025" on source map and as polygon if greater.

Submerged Stream	46100	feature type only: no attributes

SWAMP/MARSH - A noncultivated, vegetated area that is inundated or saturated for a significant part of the year. The vegetation is adapted for life in saturated soil conditions.
Capture feature as a polygon if identifiable on source map.

Swamp/Marsh	46600	feature type only: no attributes

TUNNEL - An underground or underwater passage.
Capture feature as a line if identifiable on source map.

Tunnel	47800	feature type only: no attributes

UNDERPASS - The grade separation where part or all of one feature instance is directly above part or all of another feature instance.
Capture feature as a point if shortest axis less than .025" on source map and as polygon if greater.

Underpass	48100	feature type only: no attributes

WALL - An upright structure of masonry, wood, plaster, or other building material serving to enclose, divide, or protect an area.
Capture feature as a line if identifiable on source map.

Wall	48300	feature type only: no attributes
Wall	48301	Wall Type | general case
Wall	48302	Wall Type | sea

WASH - The usually dry portion of a stream bed that contains water only during or after a local rainstorm or heavy snowmelt.
*Capture feature as a line if shortest axis less than .025" on source map and as polygon if greater.

Wash	48400	feature type only: no attributes

WATER INTAKE/OUTFLOW - A structure through which water enters or exits a conduit.
Capture feature as a point if shortest axis less than .04" on source map and as polygon if greater.

Water Intake/Outflow	48500	feature type only: no attributes
Water Intake/Outflow	48501	Water Intake/Outflow Type | intake
Water Intake/Outflow	48502	Water Intake/Outflow Type | outflow

WATERCOURSE - A section of physical features, i.e. artificial path, river/stream, or levee, referenced by a common name.

WATERFALL - A vertical or near vertical descent of water over a step or ledge in the bed of a river (see also Nickpoint).
Capture feature as a point if shortest axis less than .025" on source map and as polygon if greater.

Waterfall	48700	feature type only: no attributes

WELL - A pit or hole dug or bored into the earth for the extraction of oil, water, other fluids, or gases.
Capture feature as a point if identifiable on source map.

Well	48800	feature type only: no attributes
Well	48801	Product | heat
Well	48802	Product | water; Flow Status | flowing; Water Characteristics | unspecified
Well	48803	Product | water, Flow Status | unspecified; Water Characteristics | alkaline
Well	48804	Product | water; Flow Status | unspecified; Water Characteristics | hot
Well	48805	Product | water; Flow Status | unspecified; Water Characteristics | sulphur
Well	48806	Product | water; Flow Status | unspecified; Water Characteristics | unspecified

WRECK - The hulk or the ruins of a disabled vessel which is attached to or foul of the bottom or cast up on the shore.
Capture feature as a point if identifiable on source map.

Wreck	49200	feature type only: no attributes
Wreck	49201	Relationship to Surface | above water; Abovewater Portion|hull and/or superstructure
Wreck	49202	Relationship to Surface | above water; Abovewater Portion | mast and/or funnel
Wreck	49203	Relationship to Surface | underwater

Appendix B
Selected References

Publications of the *Kansas GIS Standards Task Force and Working Groups:*

Kansas Geodata Compatibility Guidelines, Version 2.2, August 1997.
Online linkage: <URL:http://gisdasc.kgs.ukans.edu/dasc/docs.html>

Kansas Geospatial Metadata Standard -- KIRC Policy #5100, effective October 1, 1996 (states that Kansas Standard is same as the Federal Geographic Data Committee's Content Standard for Geospatial Metadata. See in Other Publications)

Draft - Kansas Geospatial Data Standards, Jurisdictional and Administrative Boundaries, Version 1.0, February 1998

Kansas GIS Cadastral Standards, August 1997 -- KIRC Policy #5120, effective June 1, 1998.
Online linkage: <URL:http://gisdasc.kgs.ukans.edu/dasc/docs.html>

Draft - Kansas Geospatial Data Addressing Standard, First Edition, August 17, 1998
Online linkage: <URL:http://gisdasc.kgs.ukans.edu/dasc/docs.html>

Kansas Geospatial Data Horizontal Geodetic Control Standard — Acceptance, by reference, of the Federal Geospatial Data Horizontal Geodetic Control Standard.

Other publications:

National Hydrography Dataset:

Standards for National Hydrography Dataset - Draft
Online linkage: <URL:http://mapping.usgs.gov/standards>

Standards for National Hydrography Dataset--High Resolution - Draft
Online linkage: <URL:http://mapping.usgs.gov/standards>

DRAFT Reference Guide (previously titled Data Users Guide)
Online linkage: <URL:httpL//nhd.usgs.gov/>

U.S. Environmental Protection Agency, 1995, *Method Accuracy Description (MAD), Version 6.1 Information Coding Standards for the U.S. Environmental Protection Agency's Locational Data Policy (LDP)*: Washington, DC.
Online linkage: <URL:http://www.epa.gov/docs/ngispr/mad.html>

Federal Geographic Data Committee, 1998, *Content standards for digital geospatial metadata (version 2.0)*: Washington, Federal Geographic Data Committee. (FGDC-STD-001-1998)
Online linkage: <URL:http://www.fgdc.gov/metadata/meta6894.html>

Federal Geospatial Data Horizontal Geodetic Control Standard

Other Selected References and Sources:

Data Access and Support Center (DASC), KGS, University of Kansas, 1930 Constant Ave., Campus West, Lawrence, Kansas, 66047 — Ph. (785)864-3965x410 — URL <http//:gisdasc/kgs.ukans.edu>