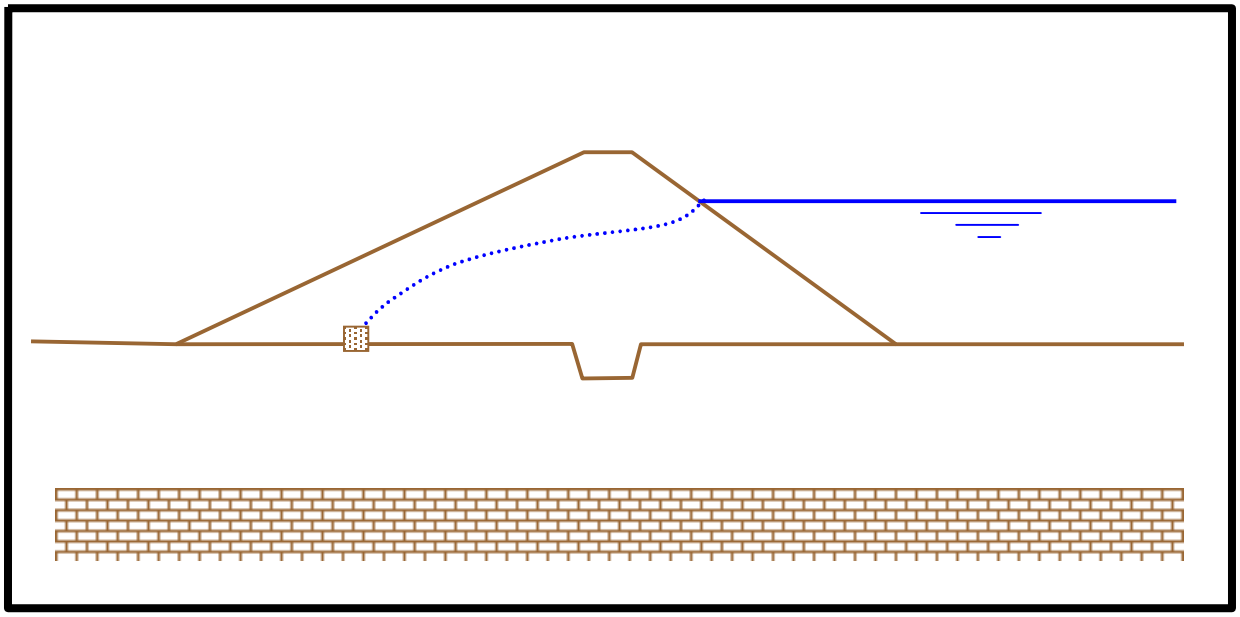
E.13. Indiana

GENERAL GUIDELINES FOR NEW DAMS AND IMPROVEMENTS TO EXISTING DAMS IN INDIANA

2001 Edition



Department of Natural Resources
Division of Water
Indianapolis, Indiana

2010 Appendix A, Appendix B Revisions included

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PREFACE – January 1, 2001

These guidelines are directed to project engineers, technical professionals and owners involved in the design and construction of a proposed dam or the modification of an existing dam that is under the jurisdiction of the Indiana Department of Natural Resources (IDNR). The intent of these guidelines is to provide direction to experienced dam design professionals so that the final product, the dam, is safe and the owner's investment in professional engineering is maximized.

The majority of information given in this document is general and provides many of the dam safety technical principles used throughout the country. The Project Engineer in charge of the design of a dam must be a registered professional engineer and have the training and experience to properly apply these guidelines to the specifics of the site and the needs of the owner. If the owner's Project Engineer follows these guidelines and an appropriate engineering design package is submitted to Indiana DNR's Division of Water, the time to obtain approval on the proposed work will be significantly reduced.

These guidelines were modeled after Georgia's Safe Dam Program Engineering Guidelines, 1998 edition. Special thanks are extended to Georgia's Dam Safety personnel and the private engineering community practicing in Georgia for the special opportunity to utilize much of their work in these guidelines.

A committee of 17 professionals from the private engineering community and IDNR contributed significant time to the development of these guidelines. These individuals are listed below:

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The Federal Emergency Management Agency (FEMA) provided partial funding for the project and the Association of State Dam Safety Officials (ASDSO) encouraged the Division of Water to publish these guidelines. The backing of these two organizations in this project and their long-term support of dam safety efforts in Indiana are appreciated.

Dr. Brian J. Swenty, P.E., Associate Professor and Chair, Mechanical and Civil Engineering Department, University of Evansville, Evansville, Indiana edited the guidelines.

PREFACE – February 1, 2010

Revisions to the guidelines were made in February 2010 to provide clarification in the development of emergency action plans and to properly define hazard class. The definition of hazard classification was developed and defined in regulation and reference to an adapted table is not warranted.
To provide this clarity and new definition,

Appendix A - Table 3 was removed and replaced with the context of the enacted regulation that defines hazard class.

Also, Appendix B – The original "Outline of an Emergency Action Plan" was removed and replaced with a cover sheet that directs the reader to the "Indiana Dam Safety Inspection Manual – Updated 2007" version and Part 4 of that manual. The new Part 4 is entitled "Emergency Preparedness" and represents the recommended guidance for preparation of an Emergency Action Plan (EAP). Templates for an EAP are included in the "Updated 2007 Indiana Dam Safety Inspection Manual".

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Overview

Section 1
OVERVIEW

The general guidelines contained in this manual are useful for the design of small to medium sized dams with the following typical characteristics:

- An earth embankment with appurtenant works constructed to remain stable under a variety of loading conditions for the design life of the structure.
- A properly sized principal spillway that will convey the runoff from normal rainfall events.
- An emergency spillway channel placed an adequate distance from the earth embankment that will operate infrequently and safely pass runoff from the design storm without overtopping the dam.

Guidance on analyses and design issues for innovative, untested, or high-risk dam designs is not covered in these guidelines. The extent of engineering tests, analyses, studies, evaluations, and assessments that are needed to justify an atypical design is beyond the scope of this manual. Further, the time to conduct the additional and extensive engineering analysis and review can be significant when compared to the typical dam described above.

Because each project requires site-specific considerations, these guidelines should not be viewed as a "cookbook" for the design, repair, modification or construction of a dam. The intent of this document is to outline the general technical data, engineering computations, and plans that need to be submitted with the permit application for the proposed work. If these guidelines are followed, the time necessary for the technical review and approval should be reduced. Questions concerning these guidelines should be addressed to the Division of Water at the Indiana Department of Natural Resources, 402 W. Washington Street, Indianapolis, Indiana, 46204.

Dams are complex structures that typically require a multidisciplinary analysis and design approach. Over the years, there have been many incomplete engineering submittals to the Department of Natural Resources (IDNR) that lacked adequate detail in a particular technical area (hydrologic/hydraulic, geotechnical, geological, surveying or structural). The analysis and design of a dam should be supervised by a Project Engineer who is a registered professional engineer. A complete engineering submittal requires adequate technical input and support from hydrologic, hydraulic, geotechnical, geological, structural, and mechanical engineers, as well as licensed land surveyors. It is important for the Project Engineer to consider archaeological and environmental issues in the design or modification of a dam.

An understanding of the roles of the various stakeholders is necessary for the design, construction, and operation of a safe dam.

1.1 Owner's Role

The storage of water is a hazardous activity; it creates increased risk to lives and property situated downstream of the dam. The owner of a dam is responsible for operating and maintaining the dam in a safe manner.

Under Indiana law, IC 14-27-7; "The owner of a dam ... and appurtenant works shall keep the structures and appurtenant works in the state of repair and operating condition required by the following":

- The exercise of prudence.
- Due regard for life or property.
- The application of sound and accepted engineering principles.

A property owner desiring to construct a dam should retain the services of a registered professional engineer experienced in the design and construction of dams and spillways. It is common practice for the owner and the engineer to discuss the owner's needs, the intended purpose of the dam, and the project budget before any design work is performed. During the design process, the owner remains in close contact with the engineer to periodically review the design and the desired project goals.

During construction, the owner works closely with both the engineer and the contractor. Unforeseen site conditions are frequently uncovered that require the owner to approve design changes. The Division of Water should be contacted before field changes are made to the approved plans.

After construction, an owner assumes the role as the primary caretaker of the project. Routine inspection and maintenance allows early detection of many problems that could occur with a dam. The owner should inspect the dam often, keep records of observations and measurements and learn as much as possible about the operation and maintenance of the dam.

Although a dam can be designed and constructed to be a safe structure, lack of routine maintenance and repair, or changing conditions, can eventually cause the dam to become unsafe. If a dam is not in compliance with State law, the owner will be required to improve the dam to bring it into compliance.

The owner may want to confer with an experienced attorney to assess the liabilities of owning a dam.

1.2 Role and Selection of a Project Engineer

The analysis and design of a dam should be supervised by a Project Engineer, who is a registered professional engineer with specialized expertise. These activities require an understanding of hydrology, hydraulics and the behavior of the materials used to construct and support the dam. The Project Engineer will likely need specialized technical input and

support from hydraulic, geotechnical, geological, structural, and mechanical engineers as well as licensed land surveyors.

The primary role of a Project Engineer is to provide leadership in the planning, design, and construction of a dam. A Project Engineer is responsible to see that all technical aspects of the dam and site have been completely evaluated. To accomplish this, the Project Engineer works closely with the owner to establish clear objectives and thoroughly evaluate the proposed dam site. A Project Engineer should have the experience necessary to combine the owner's objectives with the site's potential to develop a design for a safe dam. The Project Engineer supervises the preparation of the permit application, plans, specifications and engineering report, but the engineer's involvement does not end with the submittal to IDNR's Division of Water. It is vitally important that the Project Engineer be involved in the construction of the dam to assist the owner is resolving unforeseen problems at the site and ensure that the dam is constructed in accordance with the approved design. Once the dam has been constructed and the reservoir has filled, the Project Engineer should certify that the dam was constructed in accordance with the design plans and submit as-built drawings to the Division of Water.

Because the design of a dam requires a professional engineer who possesses unique abilities, it is preferable to select a Project Engineer based on qualifications rather than fee. While fee-based competition may result in lower initial design costs, lower costs are often associated with inexperienced engineers and frequently limit the engineer's ability to conduct detailed evaluations that are necessary to develop a cost effective and innovative design. Furthermore, a low design cost often results in a significant increase in the cost of construction as well as long term costs associated with operation and maintenance of the dam.

The Project Engineer should be selected on the basis of technical qualifications, experience with similar projects, reputation with other clients, and capability to meet the owner's time schedule. It is usually best to solicit qualification statements from a number of engineers and perhaps interview several of them before making a selection. Once a qualified engineer is selected, the scope of services and fee can be negotiated. If a reasonable fee cannot be agreed upon, negotiations will terminate and discussions can begin with another qualified engineer. It is best, however, if design costs become a factor only after a well qualified professional has been identified.

1.3 Contractor's Role and Selection

The contractor's primary role is to construct the dam and the appurtenant works in accordance with the plans and specifications. It is the contractor's responsibility to notify the engineer of any changes in the site conditions exposed during construction that vary from those shown on the drawings, in the specifications, or in any documents on site investigations. The contractor is responsible to see that the construction is conducted in a safe manner, that all state, federal and local regulations are adhered to during construction, and that the construction site is secure. The contractor is not responsible for the design of the

dam or modifications to the design made by the engineer. The contractor is responsible for all construction activities including the quality of workmanship used to construct the dam.

Selection of a qualified contractor is very important. The owner, in consultation with the engineer, should pre-qualify potential bidders. Requests for bids or quotes should be requested from contractors on the pre-qualified list. Items to be considered in the pre-qualification process vary. As a minimum, they should include previous experience in constructing dams comparable in size to the project, a history of satisfactory construction performance, adequate manpower and equipment to complete the project in a reasonable time frame, sufficient financial resources, a history of paying subcontractors, familiarity with local conditions, and a past record of displaying a cooperative attitude. Request and contact references.

The owner should select the best-qualified contractor who responds to the request for bids with a reasonable price for the work. A private owner is not required to select the lowest bidder; a governmental owner may, however, be bound by its enabling statutes to select the lowest bidder. An unusually low bid should be viewed with skepticism. It may be that the contractor has idle resources that are available to do the job, or it may be an indication that the contractor has forgotten something, is inexperienced, or follows a practice of bidding low then negotiating costly change orders during the project.

Bonding of the selected contractor should be included in the contract documents. The contractor should be required to obtain both performance and payment bonds. Payment bond references should be contacted. The contractor should warrant the work against defects for a period of at least one year after completion of the work.

1.4 Project Concept

Prior to constructing a new dam, or modifying an existing dam, certain engineering tasks are typically required to investigate, plan, analyze, and design the project. In many cases environmental, legal, real estate, utility, archaeological, historical, cultural, and other considerations related to a project are investigated and incorporated into project analysis and design. The determination of critical site information during earlier stages of the dam project may have a significant impact upon later stages of the project.

Phased design and construction is a process that should be seriously considered when difficult site conditions are encountered. Dividing a dam project into phases provides all parties with more time to make a reasonable determination of the anticipated scope and costs of the associated investigation, planning, analysis, and design work to be provided in each specific phase. Upon completion and review of each phase, the Project Engineer is better informed and prepared to advise the owner regarding tasks which will be necessary for the next phase. Estimates for construction quantities and costs are continually refined after each phase of the project as more accurate information concerning site conditions and suitable design alternatives becomes available.

Phased design and construction provides intermediate opportunities to discuss information and conditions determined during each project phase with regulatory agencies and stakeholders. Critical input concerning acceptable design methods and procedures can be obtained for application in subsequent phases.

Because the construction of a dam involves a significant financial investment, a primary advantage of phased design and construction is the opportunity it affords an owner to consult with the Project Engineer concerning the overall project and financial direction. Since dam projects are typically complex and very site specific, construction techniques and the scope of work may need to be changed to accommodate site conditions.

Actual project phases may vary and some overlap may occur. Depending on the length of time required to complete each phase, previous data may become obsolete and may need to be updated. Following are typical phases of a dam project through construction:

1.4.1 Reconnaissance Study – This is normally the initial phase of a dam project and involves the following tasks: site inspection of suitable locations for a new dam (or the evaluation of site conditions at an existing dam); discussion of the project goals and objectives with the owner; review of property ownership issues; investigation of available information and previous studies of existing dams; determination of general watershed characteristics, which include geologic conditions, soil conditions, preliminary hydrologic factors, possible access locations, potential downstream effects, and the hazard classification of the dam; evaluation of the potential for future downstream development that might increase the hazard classification during the life of the structure; determination of archaeological or historical limitations; determination of local, state, and federal regulatory jurisdictions; preliminary discussions of the project with regulatory personnel; initial discussions of the project with technical professionals in other disciplines and environmental professionals; and if possible, initial discussion of the project with a suitable contractor(s).

A site reconnaissance can disclose a number of surface features that may provide an indication of the subsurface conditions that exist at the site. These observations involve such items as the extent of alluvial depositions, topography, rock outcroppings, karst features, mining, and vegetative cover. A review of published data, including the geology and general soil conditions of the site, will provide significant additional information. Depending on the complexity of the project, other preliminary evaluation techniques may be considered. This information assists the owner and the design engineer in establishing the best preliminary conceptual design for the project, and provides valuable information concerning those areas where more detailed geotechnical evaluations should be concentrated.

1.4.2 Feasibility Study - Based on the preliminary discussions and the information obtained during the reconnaissance study, a preliminary estimate of anticipated engineering costs, mitigation costs, and possible construction costs is determined. This information provides the owner with an initial opportunity to determine whether the

project is financially feasible prior to further expenditures. It is extremely important to remember that preliminary estimates developed during this phase of the project are based on incomplete information and therefore represent only rough estimates of the possible magnitude of the project. These preliminary estimates are not intended to be applied or construed as final project costs.

1.4.3 Preliminary Engineering - During this phase of the project, limited information is obtained through field surveys, geotechnical field testing, and laboratory testing. Studies are undertaken to develop suitable alternatives, including initial estimates of quantities and costs. The Project Engineer assembles a team of qualified technical professionals, based on the project requirements. Suitable topographic maps may be developed from field survey data, a geotechnical report is published, hydrology and hydraulic analysis are conducted, and an environmental reconnaissance is performed. Other studies (water yield, sediment storage, mine tailings storage, etc.) may be performed depending on the scope of the project.

Upon completion of development of suitable alternatives, the Project Engineer presents the results of the preliminary engineering phase, including recommended alternatives to build or improve the dam, to the owner.

1.4.4 Design Phase – After an alternative is selected by the owner, the Project Engineer oversees the final design and preparation of the engineering report, construction plans and technical specifications.

Additional field survey information, geotechnical testing and analysis, environmental reconnaissance, and other technical studies may be required.

Upon completion of the construction plans and specifications, quantity estimates and costs are determined.

1.4.5 Permit Phase - Permit applications for all Local, State, and Federal regulatory agencies having jurisdiction over the project are completed, submitted, and public notice is provided.

1.4.6 Construction Bid Phase – When applicable, construction bid documents are prepared by the Project Engineer's professional team, which provide rules and guidelines for the construction bid process. The construction plans and technical specifications are included as part of the bid documents. Pre-qualification requirements for bidders are established. Requests for bids are distributed to suitable contractors. After receipt of bids, the owner, with the advice of the Project Engineer, selects the best-qualified contractor providing a reasonable price.

1.4.7 Construction Phase - After receiving all permits and approvals, acquiring all necessary property control (property ownership, easements and right-of-ways), and selecting a contractor, construction scheduling and construction activities begin.

Field survey services are used to stake and verify construction locations, alignments, elevations, and grades.

The Project Engineer should be retained to provide construction management services and monitor the construction of the dam. Material testing should be conducted throughout construction to verify that specifications are met. The Project Engineer or a member of the technical team involved in analysis and design should be available for inspection, observation and consultation during all construction activities, especially the excavation of the core trench, the installation of conduits through the dam, the installation of internal drains, and the placement of embankment fill. Because the most dangerous time in the life of a dam is first filling of the reservoir, the Project Engineer should be involved in monitoring this critical phase of the project.

Upon completion of construction activities, the Project Engineer prepares as-built drawings which note any changes or deviations from the approved design/ construction plans and submits the as-builts to the Division of Water.

1.5 IDNR Permit

These Guidelines supplement the Technical Review information in Chapter 5 of the 1996 Indiana Department of Natural Resources Permit Manual. The guidelines provide property owners and their design consultants with general information related to the technical permit requirements for dams in Indiana.

Items related to the completion of the Construction in a Floodway Permit application, environmental issues, and easements are addressed in IDNR's 1996 Permit Manual and should be followed when preparing a permit application.

Prior IDNR approval (permit) should be obtained by anyone desiring to construct or significantly modify (work that is not routine maintenance) a dam before work begins, if the dam meets any one of the following criteria:

- The drainage area above the dam is one (1) square mile or greater.
- The height of the dam, measured from the natural streambed below the crest of the dam to the lowest point on the crest, is equal to or greater than 20 feet.
- The volume of water impounded by the dam at the emergency spillway elevation, is 100 acre-feet or more.

If a permit is required for the proposed project, it will be necessary for the property owner to obtain the services of a registered professional engineer experienced in dam design, construction, repair and maintenance to take responsibility as the Project Engineer.

In order to expedite the permit process, the Project Engineer should meet with the Division of Water staff to discuss details of the project before work commences on the plans,

specifications, and engineering report. It is important that all survey, hydrology/hydraulic, geotechnical, structural and mechanical engineering evaluations are complete and accurate prior to submitting an application for a permit. It has been the staff's experience that when incomplete technical information is submitted with the application, the permit process is delayed months and in some cases years.

1.6 Emergency Action Pans

1.6.1 An Emergency Action Plan (EAP) is a formal plan that identifies potential emergency conditions at a dam and outlines the procedures to follow to minimize property damage and loss of life. All high hazard dams should have an EAP (see Appendix B for an outline).

1.6.2 An EAP is needed to preplan the actions taken by the dam owner, State Emergency Management Agency (SEMA) personnel, and local emergency officials during an emergency. This preplanning will help provide for timely notification, warning, and evacuation in the event of an emergency.

1.7 Enforcement Actions

Indiana Code 14-27-7, requires owners to keep their dam in a state of repair and operating condition required by the exercise of prudence, due regard for life or property, and the application of sound and accepted engineering principles. Routine maintenance and compliance with the conditions of the permit are required. A sample owner's inspection checklist is included in Appendix B.

The Division of Water inspects existing dams to determine their condition and continued compliance with state laws, regulations, and policies.

Occasionally, an owner will choose not to maintain the dam or will resist complying with the Indiana Code provisions for constructing and operating a safe dam. Depending on the seriousness of the situation, the Division of Water has several processes for bringing the dam into compliance ranging from certified letters to appropriate litigation. Fines can be issued and the dam can be breached at the owner's expense.

Field Survey

Section 2
FIELD SURVEY

2.1 Introduction

Collection of accurate field survey information is critical to determine existing site conditions, prepare suitable designs, and successfully construct a dam. Accurate field survey information is required for many aspects of a dam project. Listed below are some of the common, acceptable survey principles that are used by professionals practicing in the dam safety field.

2.1.1 Accuracy

The field survey information necessary for designing dams and spillways, developing construction plans, and verifying construction activities is typically required to be accurate, both horizontally and vertically to a minimum of 0.1 foot, except for preliminary and reconnaissance surveys, where horizontal accuracy of one foot may be acceptable. In certain situations, additional accuracy to a minimum of ±0.01 feet may be necessary.

Although less accurate (nearest foot) site information can be used in preliminary stages of the project to determine alternatives and quantity estimates, the Project Engineer should assess the approximate accuracy of this information to make sure reasonable estimates of locations, alignments, grades, and quantities are obtained.

2.1.2 Datum

Temporary benchmarks (TBM) should be established at the dam and tied to an NGVD vertical datum. TBM's can be used to obtain reliable survey data to design, construct and monitor the performance of the dam throughout the project life. Use of established datums connects the dam to other surveys and maps in the area, and enables the Project Engineer to use information from other sources.

Vertical control (elevations) is typically established on the National Geodetic Vertical Datum of 1929 (NGVD'29) or the North American Vertical Datum of 1988 (NAVD'88). Assumed datums may be suitable for minor improvements or repairs.

Horizontal control is important to verify property boundaries and determine the extent of the reservoir at both normal and maximum pool. Control stations for horizontal control should be established on the North American Datum of 1927 (NAD'27) or the North American Datum of 1983 (NAD'83) using Indiana State Plane Coordinates in U.S. Survey Coordinates (feet) or Universal Transverse Mercator (UTM) coordinates (meters). If a sufficient number of permanent survey markers are placed at a site, an assumed datum may be appropriate to monitor the long term performance of a dam.

2.1.3 Property Boundary

The Project Engineer should determine the project boundary and property boundary for the site. This information should be shown on the plans as well as any easements for property that may be inundated by the reservoir during the design flood.

2.2 Topographic Mapping

Development of accurate topographic mapping is desirable in the initial stages of a dam project in order to establish existing locations, alignments, and grades. The topographic information should provide reasonable accuracy for the determination of alternatives and preliminary estimates of quantities. Development of suitable contour information for proposed or existing impoundment areas is especially important in determining stage-storage relationships for the hydrologic/hydraulic analysis.

Due to the extensive areas involved in large dam projects, application of aerial photogrammetry is usually an appropriate and economic alternative for the development of suitable topographic mapping and site layout information. Field surveys are required to establish the coordinate locations and elevations of specified ground control points prior to development of the topographic mapping by aerial photogrammetry. These temporary monuments establish the necessary horizontal and vertical control to develop a topographic map of the site. It is important to note that topographic information developed from photogrammetry is typically accurate to only one half the contour interval of the topographic mapping. For example, elevation information derived from a photogrammetrically compiled map with a contour interval of 2 feet has an accuracy of ±1 foot.

Adjacent property boundaries, utilities, and other important geographical features are determined from appropriate sources and located to the accuracy required on the project site mapping. If appropriate, accurate locations and descriptions of sensitive environmental areas and archaeological resources should be delineated on the project site mapping.

A hydrographic survey of the bed of the lake at an existing dam may be needed to determine storage for a sediment or water supply study.

2.3 Field Survey for Geotechnical Testing

Field survey information is typically required in conjunction with geotechnical testing to precisely locate test borings and provide accurate cross-sections of existing dams at specified locations for stability analysis.

2.4 Field Survey for Hydrology and Hydraulics Analysis

Field survey information required for the hydrology and hydraulics analysis includes the determination of spillway control elevations and structural details for spillways at both new and existing dams. These details include the type of structure, location, size, alignment, inlet

and outlet elevations, length, outlet type, and other requested structure characteristics to determine losses in both open channels and closed conduits. Accurate determination of an existing lake pool elevation is important to help establish the stage-storage relationship for reservoir routing calculations.

Profiles and cross-sections of natural and man-made channels into which existing or proposed spillway structures will drain are typically required to determine potential backwater effects at spillway structures, the need for channel armor protection, and the design of energy dissipation devices.

For existing dams that have lake drawdown structures, inlet and outlet invert elevations, the length, diameter, and material of the pipe and the size and description of all valves, should be determined.

Finally, for both existing and proposed dams, information about downstream structures (i.e. culverts, bridges, dams, levees, placed fill, etc.) that may restrict flows and result in backwater effects at spillway structures should be determined. It is important that the datum used at any other structure be the same datum that is used at the dam.

2.5 Field Survey for Preparation of Final Designs and Construction Plans

Prior to the preparation of final designs and construction plans for a new dam or improvements to an existing dam, extensive field survey information is required to accurately define the physical characteristics of the project site. Field survey cross-sections should be obtained at intervals along the centerline of a proposed or existing dam and at appropriate intervals along the length of emergency spillways.

2.6 Construction Survey

Prior to the actual construction of the dam, a construction survey is necessary to stake actual locations, alignments, and grades of structures shown on the construction plan. During construction, additional field surveys may be required to verify information on the construction plans and to determine accurate construction quantities. It is recommended that the bottom of the core trench, internal drains, pipes through the embankment, and buried structures be surveyed before backfilling occurs.

2.7 Post Construction Survey

An as-built survey is typically performed after the completion of all construction activity to determine if the structure was built according to the plans. In some instances, the as-built survey data is used to perform hydraulic, hydrologic and geotechnical computations to verify that the dam meets minimum safety requirements.

On some dams, typically only large high-hazard dams, annual or other periodic surveys are conducted to monitor movement of the embankment and appurtenant structures.

Geotechnical and Geological Considerations

Section 3

GEOTECHNICAL AND GEOLOGICAL CONSIDERATIONS

3.1 Introduction

The identification of the site characteristics, engineering properties of the materials used to construct the dam, and geologic conditions beneath the embankment are essential to the design of a safe dam.

The geotechnical and geologic guidelines that follow are predicated on a "typical" project, generally involving a small or medium sized dam at a site with few geological challenges. It should be understood that each and every project is unique, and the geotechnical requirements may be modified accordingly. The type and quantity of field and laboratory tests conducted and the types and numbers of analyses performed will be influenced by the hazard classification and project function. A limited geotechnical investigation may be allowed on small, low-hazard dams while a comprehensive investigation is recommended for large, high-hazard dams. Unauthorized dams will require a geotechnical investigation and the same geotechnical computations as a new dam.

Structures in heterogeneous geologic settings, such as solutioned limestone or lakebed sediments may require extensive geotechnical studies. Subsurface conditions can change dramatically across a valley. Larger dams and dams with very long crest lengths may necessitate additional geotechnical investigations to properly assess the subsurface conditions.

Geotechnical evaluations for the rehabilitation of existing dams should consider the seriousness of the deficiencies. For major rehabilitation projects such as repairing breached dams, increasing the height of a dam, permanently raising the normal pool elevation of the reservoir, repairing embankment slides, modifying excessively steep slopes, and constructing control structures for extensive uncontrolled seepage and piping, the geotechnical evaluations should essentially be the same as that utilized for a new dam. The evaluation should be modified, as necessary, to target the major deficiency(s) identified. Limited geotechnical evaluations are typically acceptable for minor rehabilitation projects such as minor seepage, unsuitable vegetation and minor slope reconfiguration.

3.2 Literature and Initial Review

The development of the subsurface exploratory program should begin with a literature review of existing geologic and geotechnical maps, reports, and other records that might provide technical background information on special conditions at the site and the surrounding area. The project details will dictate the extent of the literature search that would be beneficial in the development of the subsurface exploration program. Listed below are some sources of information that may prove helpful.

3.2.1 Geologic Maps and other geologic information

State geologic mapping will provide an indication of the geologic setting of the site. Local, detailed geologic mapping and pertinent information may be available in or near the project area. The Indiana Geological Survey (IGS) located in Bloomington has a wealth of information on the geology of the state and trained professionals that can assist in the interpretation of this information. General information about the IGS can be obtained from the web site "http://adamite.igs. indiana.edu/index.htm".

3.2.2 Soil Surveys

All Indiana counties have existing soil surveys that contain information on the surficial soils. These are particularly useful in the preliminary phase of planning a subsurface exploration program. Almost all counties have a Natural Resources Conservation Service office staffed with technical professionals that can address general soil conditions of the site.

3.2.3 USGS Topographic Quadrangle Maps

Topographic maps provide a general characterization of the surface features of the area under investigation and the drainage patterns which may influence site selection. U.S.G.S. 7 ½ minute topographic maps are available for the entire state. More detailed topographic mapping may be available for certain local areas.

3.2.4 Other Sources of information

- Aerial Photographs
- Well Records
- Technical publications pertaining to the area
- Technical records or inspection reports on existing dams near the site
- Special maps (abandon coalmines, underground caves, etc.)

3.3 Site Reconnaissance

A thorough reconnaissance of the entire site and adjacent areas by the Project Engineer and the geotechnical engineer or engineering geologist is considered to be essential for both new dams and major modifications to existing dams. Typically, a reconnaissance is performed prior to implementing the exploration program to determine the best methods to employ. Additional site reconnaissance may be conducted during or after the field program to help interpret the data being obtained. Vegetative cover, rock outcroppings, and small topographic features (that may not be discerned from the literature review alone) provide useful input.

The primary emphasis of the site reconnaissance is the area within the embankment footprint and areas immediately upstream and downstream. These would include the creek bottom, flood plain, abutments, and any potential open channel spillway alignments within the abutments or areas removed from the dam site. In certain instances, the reconnaissance may include the entire reservoir footprint. It is very important for the reconnaissance team to include the land owner in the site reconnaissance to help identify potential borrow sources and locations of unusual geologic conditions such as rock outcroppings, caves, and springs. A downstream inspection is recommended to better identify the hazard classification.

3.4 Geologic Mapping

Site-specific geologic mapping may be warranted in some instances. This would be particularly applicable to large dams, and those located in unique geologic settings. The applicability of such a method (prior to the subsurface exploration program) is directly related to the amount of rock outcropping that may be identified during the site reconnaissance. In the absence of outcroppings, geologic mapping may be of limited use. Where shallow rock exists, that is not otherwise exposed, test trenches may be appropriate to expose these materials for direct observation.

3.5 Subsurface Exploratory Program

The objective of a successful subsurface exploration program is to strategically obtain samples and pertinent information for an engineering evaluation of all the materials that will affect the performance of the dam and appurtenant works. The Project Engineer should balance the use of in-situ exploratory procedures with the option of obtaining both disturbed and undisturbed samples for laboratory testing. On large dam projects, strength and permeability tests are usually performed on undisturbed foundation samples and remolded samples of borrow material. For small, low hazard dams, laboratory identification tests of bagged samples can be used to obtain assumed shear strength and permeability parameters. The use of conservative shear strength parameters may result in an over-designed structure, thus the Project Engineer must balance the cost of exploration with the cost of over-designing and over-building the dam. Using assumed shear strength parameters may be a reasonable approach for small, low hazard dams, but should not be used for large dams. The use of a haphazard approach to subsurface exploration wastes money and can lead to the design and construction of a potentially unsafe dam where failure may result.

3.5.1 Test Borings

Test borings are typically placed within the footprint of the dam and appurtenant structures. Boring locations on existing dams should target the specific deficiencies identified while considering accessibility to the site. For existing dams with minor deficiencies where sufficient documentation concerning the design, construction, and performance of the dam is available, the need for borings may be minimal.

3.5.1.1 Centerline of the Dam - The number of test borings along the centerline of the dam should be based on the needs of the design. Past experience indicates that three borings along the centerline of small dams with a short crest length is adequate.

3.5.1.2 Embankment Toe - Borings at the upstream and downstream toe should be considered for most dams to delineate the soil stratigraphy in the valley.

3.5.1.3 Conduit and Internal Drain Locations - Additional borings may need to be placed beneath proposed conduit and drain locations to identify subsurface conditions within these specific areas. These borings can provide information to evaluate highly compressible soil layers, weak foundation soils, permeable anisotropic soils, and high ground water conditions.

3.5.1.4 Open Channel Spillways - Open channel spillways in the abutments are typically evaluated with borings, if significant depth of excavation is anticipated. These borings should at least penetrate the depths of excavation and identify the properties of the materials at the base of the channel.

3.5.1.5 Depths and Samples - Boring depths within the embankment footprint area will generally mirror the height of the embankment above each individual boring, with a minimum depth of 15 feet typical. Disturbed samples obtained by Standard Penetration Testing, or other suitable methods, are normally made on 2.5-foot intervals unless there is evidence that the material is relatively homogeneous in which case 5.0-foot intervals may be appropriate.

3.5.2 Test Pits

Test pits excavated with a backhoe can provide useful information in certain portions of the site. Several excavations often allow a more thorough assessment of the upper stratigraphy, and can provide indications of potential difficulties that may be encountered during construction. In situations where the dam is a small, low hazard structure and sound, tight rock is near the surface, test pits that may significantly reduce the quantity of borings. Otherwise the following should be considered:

3.5.2.1 Flood plain - Alluvial deposition is typically complex. Soil test borings alone often do not clearly represent the conditions encountered within flood plain areas. Test pits can provide a better indication of subsurface variability, depths of organic material, past seismic activity, and difficulties that may be encountered relative to groundwater inflow.

3.5.2.2 Shallow Rock - Test pits may be used to supplement the evaluation of general areas where shallow rock is encountered. This helps discern if the refusal materials are fairly continuous rock and whether the rock surface is uniform. This may be particularly useful at sites with karst geology.

3.5.2.3 Open Channel Spillways - Test pits may be an inexpensive means of evaluating areas where the depths of excavation anticipated for channel spillways are minimal.

3.5.3 Rock Coring

Some rock coring is recommended within the footprint of the dam if refusal is encountered at depths less than about half the originally planned boring depth, with appropriate consideration of the geology of the site.

3.5.3.1 Depths - The amount of rock core to be obtained in each hole depends on a number of factors including the size of the dam, geologic setting, and rock quality. Typically, a minimum of 10 feet of rock should be cored at each location.

3.5.3.2 Packer Tests - Packer permeability tests may be performed in conjunction with the rock coring where there is an indication the rock mass is jointed, solutioned, or has significant discontinuities. The Packer Test will assist the geotechnical engineer in determining the hydraulic conductivity of the rock mass (see section 3.7).

3.5.4 Preliminary Instrumentation for Piezometric Levels

The subsurface exploratory program may include the installation of observation wells or piezometers to establish the groundwater conditions within the footprint of a proposed dam or assess seepage-related deficiencies in an existing dam.

Strategically placed piezometers can provide valuable information on conditions in existing dams. For new dams, the installation of piezometers allows the geotechnical engineer to monitor pore pressures during first filling of the reservoir and throughout the life of the structure. This data can be used for analyses and for long term monitoring of dams. See Section 3.10 and Geotechnical Addendum/Instrumentation in Appendix C for further discussion.

3.5.5 Test Samples

3.5.5.1 Disturbed Samples - Split-spoon samples from borings and samples from test pits should be obtained for classification and correlation.

3.5.5.2 Undisturbed samples - A sufficient number of relatively undisturbed samples should be obtained to evaluate foundation materials, especially at large dams. A sufficient number of samples are needed to accurately characterize the differing types of materials present in the valley and abutments. Strength, compression, and permeability tests on undisturbed samples produce data that

is helpful in evaluating the stability of the dam and determining the expected behavior of the materials left in place to support the dam.

3.5.5.3 Bulk Samples - Disturbed bulk samples from test pits or auger cuttings are typically collected, particularly for explorations made in open channel spillway areas and potential borrow areas.

3.5.6 Other Exploration Techniques

Several other exploration techniques may be considered in special situations to address specific areas of concern. Examples include pressuremeter testing or cone penetrometer soundings, particularly in soft foundation materials that may be left in place to support the dam. Geophysical exploration techniques may also be appropriate in some instances.

3.6 Borrow Study

The ultimate purpose of a borrow study is to identify sufficient quantities of acceptable borrow materials that can be used in the construction of the dam. This can be accomplished by estimating the quantity of material needed in the dam and conducting adequate explorations and laboratory analyses to determine the soil profiles in the borrow areas.

3.6.1 Locations

It is important to locate the borrow areas far enough away from the dam so that any excavation below the top of dam elevation does not jeopardize the integrity or the performance of the structure. There are many site and project specifics that will dictate this distance. For small to medium sized dams situated on a geologically "good" site, the location of any borrow area that will be below the dam crest elevation should be kept 200 feet or more from the dam.

3.6.1.1 Open Channel Spillways - For projects involving the excavation of open channel spillways in the abutment areas, it is recommended that these materials be evaluated for use in the construction of the dam. See Sections 3.5.1.4 and 3.5.2.3.

3.6.1.2 Reservoir Area - Any portion of the reservoir area that will be excavated for borrow material should be investigated. Under no circumstances should bedrock be uncovered and left exposed in a borrow area that is within the reservoir boundary.

3.6.2 Exploratory Techniques

The exploration of potential borrow sites should be sufficient to characterize the usable soil deposits(s) both from a geological and engineering perspective. The study

should demonstrate homogeneity relative to the deposit(s) under consideration. Exploratory holes are typically placed on approximately 500-foot centers on a rough grid system at all practical locations.

3.6.2.1 Test Pits - Test pits are the preferred exploration technique for the evaluation of borrow sources where the potential depths of excavation are limited, or where the occurrence of suitable material is near the surface. Soil stratigraphy can be determined in more detail, and the variability and inclusion of unsuitable materials may be more readily observed with test pits. Discreet sampling of specific soil layers and combined sampling of two soils in the vertical profile can easily be done using this technique.

3.6.2.2 Borings - Auger borings are typically required where greater excavation depths are planned.

3.6.3 Sampling

Small grab samples of foundation, abutment, and borrow materials are useful for general classification purposes. Sealed samples of this type can be used to determine in-situ moisture contents. Bulk samples are required on all materials that may be used as embankment fill. Sufficient quantities of bulk material are obtained based on the types of laboratory tests to be performed.

3.7 In-Situ/Field Testing

In-situ testing, or field testing, may be considered in the evaluation of foundation conditions for new dams and in the evaluation of conditions within and beneath existing dams. Typical conditions that may warrant in-situ testing include soft compressible foundation materials that cannot be sampled routinely for laboratory testing, evaluation of seepage through foundations and existing embankments, evaluation of the continuity and integrity of foundation rock, and the determination of excavation quantities and methods.

The utilization of field test methods will depend on the size and length of the dam, the type and extent of foundation materials encountered, and the economic feasibility of a particular method over another. In-situ methods may be used to supplement more common exploration techniques such as soil test borings. Some geologic settings and embankment conditions may necessitate the use of one or more of these methods (see Appendix C - Geotechnical Addendum - Insitu/Field Testing).

3.8 Laboratory Testing

The laboratory testing program typically consists of soil classification and may also include a determination of shear strength parameters, permeability, and compressibility properties of soils. Appropriate in-situ tests may be considered for foundation materials. Laboratory testing of remodeled samples of potential embankment materials is typically needed to

determine the strength of the material. Depending on the size and hazard classification of the dam, a relatively extensive testing program may be required to characterize all of the material types in the foundation and the embankment**.** It may be necessary to perform duplicate tests on significant soil material types to verify a typical value of the material being tested.

3.8.1 Characterization Testing

This type of testing is typically performed to provide an indication of the engineering characteristics of the materials that will be used to construct the dam. These tests also provide identification of the different types of materials involved so that more extensive testing can be targeted to specific material groups.

3.8.1.1 Classification Tests - General classification tests, suitable for classifying soils by the United Soil Classification System (USCS), include gradation tests (sieve and hydrometer, as required) and Atterberg Limits tests.

3.8.1.2 Compaction Tests - Proctor compaction tests, and associated natural moisture content tests are needed to establish the basis for quality control during construction and to provide samples for strength testing. Standard Proctor compaction tests are typically utilized.

3.8.2 Strength Testing

Strength testing will normally be required to determine the shear strength parameters for the stability evaluation of both new and existing dams. Tests are typically performed on relatively undisturbed samples of foundation materials and existing embankment materials. Remolded samples of potential borrow materials are compacted to the minimum value allowed in the technical specifications and tested to determine the shear strength of the material that will be used to construct the new embankment. The state encourages engineers to perform triaxial tests on foundation and embankment soils for significant and high hazard dams. For small, low hazard dams, estimated shear strength parameters may be selected from published data in the Bureau of Reclamation's *Design of Small Dams* for the embankment and foundation material. Estimates should be based on the results of soil classification tests (Atterberg Limits, Sieve Analysis, and Hydrometer Analysis).

3.8.2.1 Triaxial Shear - Laboratory strength parameters are typically evaluated using consolidated undrained (CU) triaxial shear strength tests with pore pressure measurements. The CU test provides both total and effective strength parameters.

3.8.2.2 Direct Shear - Direct shear tests may be considered in certain instances. However, these tests are less accurate than triaxial tests and are becoming less common in the determination of strength parameters for earth dam stability computations.

3.8.2.3 Unconfined Compression - Unconfined compression tests can provide a general indication of undrained shear strength of clayey soils.

3.8.3 Consolidation Testing

Where settlement is an issue, an adequate number of consolidation tests on undisturbed foundation samples are needed to establish the settlement characteristics. Consolidation tests may also be performed on samples from proposed borrow areas that are remolded to provide reliable settlement and deformation data on each soil type proposed for the embankment.

3.8.4 Permeability Testing

Depending on the dam size and the embankment and foundation characteristics, permeability tests may need to be performed on undisturbed samples from the foundation of new and existing dams. When seepage is a concern in an existing dam, permeability tests of undisturbed embankment materials may be necessary. For new dams, remolded samples of proposed borrow materials may require permeability testing. These tests are typically performed on saturated samples to establish hydraulic conductivity characteristics of the various soil types involved. Both falling and constant head tests can be performed.

3.9 Geotechnical Analyses

Appropriate geotechnical analyses are performed to determine the geometry of the dam, the size and location of internal drains, the location of conduits within the embankment, and the location of appurtenant structures. The accuracy of these analyses depends on the validity of the parameters and assumptions developed in the preceding sections. Additional field and laboratory work may be necessary to improve the accuracy of the geotechnical models that are used by the engineer. Critical sections of the embankment should be evaluated for all expected loading conditions that could occur during the life of the dam. The intent of the geotechnical analyses is to design a safe and satisfactorily functioning structure at the lowest feasible cost.

The geotechnical design typically includes the following:

1. Provisions for monitoring the performance of the dam and maintaining the structure to assure satisfactory performance throughout its design life.

2. Evaluation of the stability of the structure during construction, at the end of construction, and during steady seepage conditions.

3. Evaluation of the stability of the dam and appurtenant structures during and after seismic events.

4. Evaluation of the stability of the dam and appurtenant structures during a rapid drawdown of the reservoir.

5. Ability of the embankment, internal drains, and appurtenant structures to experience minor consolidation settlements without adverse affects.

6. Monitoring, collection, and control of seepage through the embankment, foundation and abutments.

3.9.1 Stability Analysis

The purpose of a slope stability analysis is to determine a factor of safety for the embankment which is defined as the ratio of resisting forces (gravity forces and soil shear strength) to driving forces (gravity forces and shear stresses) along the critical potential failure surface.

For existing dams, the primary purpose of the stability analysis is to determine if the embankment is stable under various loading conditions. A stability analysis can be used to evaluate a slope failure that has occurred, design modifications to improve the stability of the embankment, or evaluate proposed changes to the height of the dam or the reservoir elevation. Loading conditions are typically limited to steady seepage-full pool, steady seepage-maximum pool, rapid drawdown, and seismic events.

For new dams, the purpose of the stability analysis is to design an embankment that will meet minimum factors of safety for a variety of loading conditions. These include loading during construction and at the end-of-construction. During the placement of fill, the construction schedule and any external loading should be considered in the analysis of the embankment. The end of construction condition is typically only of concern when rapid fill placement occurs on very soft foundations and undrained conditions occur. The steady state stability of the downstream slope should be analyzed under two loading conditions: the reservoir at the normal pool elevation after development of the steady state phreatic surface and the reservoir at the maximum pool elevation. Where drawdown facilities exist, the stability of the upstream slope is analyzed under rapid drawdown conditions. In limited instances, rapid drawdown due to submergence of the downstream toe may be a consideration. In high seismic zones, a seismic stability analysis should be performed for the downstream slope using an appropriate factor of gravity (i.e. 0.15g) for the design acceleration.

For the end-of-construction condition, the shear strengths of the foundation and dam fill are typically evaluated using total stress conditions (undrained shear strength) where the fill is placed rapidly upon the foundation materials and excess pore pressures have not dissipated. Where the foundation materials are very fine grained

and the build-up of excess pore pressure could be detrimental, piezometers should be installed in the foundation to monitor the pore pressure during construction.

For steady state conditions, the stability analysis should be performed under the assumption that the phreatic surface has been developed. The phreatic surface will begin at the "normal" pool elevation of the upstream face and extend to either the internal drainage system or the downstream slope of the dam, as determined through use of constructed flow nets or finite element seepage analysis. Drained shear strength parameters should be used to evaluate the dam under steady seepage conditions.

Drawdown pipes are encouraged for all dams, especially high hazard dams. Valves should be placed at the upstream end of the pipe to prevent the pipe from being pressurized when it is not in use. Rapid drawdown could occur if the reservoir is lowered at a rapid enough rate to prevent dissipation of the pore pressures at the upstream face of the dam. For dams built of cohesive soils, excess pore pressures may result if the drawdown exceeds 1 foot per week. This could cause an upstream slope failure that could damage the embankment and ultimately lead to the breaching of the dam. A rapid drawdown stability analysis is performed using drained shear strength parameters for the embankment. The reservoir is assumed to be at the invert elevation of the drawdown pipe and embankment pore pressures are computed with the reservoir at normal pool.

After completion of the static analyses, each of the loading considerations should be analyzed considering the appropriate seismic ground acceleration forces. Typically a pseudo-static analysis of only the downstream slope at steady state seepage conditions is performed.

Stability analysis for earth embankments should consider both slip circle methods such as Bishop, Spencer, Morganstern-Price, or Janbu's, and when appropriate, sliding wedge analyses. There are numerous computer programs which are accepted by IDNR’s Division of Water for the performance of stability analyses. The geotechnical engineer is responsible for verifying that the computer stability analyses are correct.

3.9.2 Seepage Analysis

Water will seep through all earth embankments over a period of time. Therefore, it is imperative that this seepage be recognized, monitored, and controlled. A seepage analysis may be necessary to determine pore pressures within the embankment, assess the effectiveness of seepage control options, provide quantitative data for the design of seepage control structures, and predict seepage behavior of the embankment and foundation. The analyses can assist in locating piezometers for use in monitoring seepage through the embankment and foundation.

After the phreatic surface has developed, the permeability of the embankment and foundation materials will determine the seepage flow rate. If the rate is excessive, seepage reduction and seepage collection techniques may be needed. The quantity of seepage flow, the hydraulic gradient through the dam, and the long-term effects of the exit gradient on embankment performance are of particular interest to the geotechnical engineer. Seepage reduction techniques such as cut-off keyways, slurry walls, clay core zones, and grout curtains should be considered. The seepage analysis can be used to select the most effective type of internal drainage system for the dam and foundation.

Permeability data is typically obtained from appropriate laboratory and field tests. The seepage analysis should be performed on the maximum dam cross-section upon completion of the field and laboratory testing. Either a graphical flow net analysis or a more sophisticated numerical finite element model can be used.

Analytical models will aid the geotechnical engineer in determining critical seepage areas within the dam and appurtenant structures. These include areas of excess pore pressure and high gradients. The analysis should consider the proposed drainage system to allow accurate modeling of the phreatic surface, and exit gradients at the toe of the dam. Such analysis will aid in determining if special seepage devices, such as relief wells, will be required in the final design.

It is imperative that the geotechnical engineer be aware of the implications of the seepage analysis. It is always advisable to perform an independent check of any computer calculations to verify that the results are reasonable and within tolerable limits for the structure.

3.9.3 Settlement Analysis

Both the new embankment and the foundation soils will consolidate beneath the weight of the embankment materials. The amount and rate of settlement will depend on the consolidation characteristics of the underlying soils and the rate of pore pressure dissipation. Settlement of the embankment can result in loss of freeboard, depressions on the dam crest, differential settlement along conduits which penetrate the dam, and in extreme cases, transverse cracks that can lead to failure of the dam. Excessive settlement can cause misalignment of conduits, separation of joints, and possible conduit failure which results in leaking and possible soil piping (internal erosion of embankment soils).

It may be necessary to analyze settlement to determine foundation treatment and camber, for the embankment and appurtenant structures. Laboratory consolidation tests should be performed to determine the consolidation and drainage characteristics of the embankment and foundation materials. The geotechnical engineer should consider performing a one-dimensional settlement analysis, which considers the variable loadings across the dam footprint to determine areas of critical movement. If

differential settlement and cracking of the embankment is possible, the geotechnical engineer should consider chimney drains, settlement accommodation along conduits, and joint extensibility for any jointed conduits. The effects of the calculated vertical movements on both the embankment and the appurtenant structures should be carefully considered in the design.

3.10 Instrumentation

Various instrumentation devices are typically required in the construction of large, high-hazard dams, and may be necessary on existing dam rehabilitation projects. Instrumentation can be installed to monitor the performance of the dam during construction, during initial reservoir filling, and during the life of the structure. Foundation and embankment performance may be monitored with piezometers, settlement devices, inclinometers, and seepage measuring devices. Other less common instrumentation may be considered for unusual conditions. Any instrumentation selected should target specific items to be evaluated, establish critical thresholds that suggest the need for a specific action, and establish the details of the monitoring program (see Appendix C - Geotechnical Addendum Instrumentation).

3.11 Geotechnical Report

Once the field exploration, laboratory testing program, and geotechnical analyses have been completed, a final report outlining these items as well as the geotechnical aspects of construction should be prepared. A wide range of report formats is possible. However, the following items should generally be included.

3.11.1 Introduction

A general statement of the purpose of the geotechnical study.

3.11.2 Project Information

A detailed description of the project being evaluated should be documented as part of the report. This is particularly useful if the design changes significantly from the time the geotechnical study was performed to the completion of the design documents.

3.11.3 Exploration Procedures

This section should include a description of the field and laboratory testing procedures utilized in the study.

3.11.4 Site Description

A brief description of the surface features of the project area is helpful. This includes

the project location, surface topography, vegetative cover, and identifiable surface features. The site description essentially summarizes the site reconnaissance observations.

3.11.5 Subsurface Conditions

A brief summary of the subsurface conditions identified by the field exploration program should be included. This summary generally identifies the major types of materials encountered and provides correlations between borings based on the data obtained. This section of the report identifies information gleaned from the desktop study and any geologic field mapping of the site. The intent of this section is to relate the identified subsurface conditions to the known geologic conditions at in the site, and set the stage for addressing any special or unusual conditions in the conclusions and recommendations section(s) of the report.

3.11.6 Findings

This section summarizes the results of the stability, seepage, and settlement evaluations. The results should be placed in this section or intertwined with other sections of the report. By summarizing the evaluations that were performed, the basis for the design, construction conclusions, and recommendations are established.

3.11.7 Conclusions and Recommendations

This section of the report is the most critical and should identify all of the geotechnically related design and construction items that will impact, and be incorporated into, the design contract documents. Design and construction related conclusions and recommendations might be separated or combined. Any areas of uncertainty, such as items that can only be resolved by further evaluation during the actual construction process, should be clearly identified in this section. The following items should be addressed in this significant portion of the geotechnical report.

3.11.7.1 General Assessment - A brief summary of the more significant conclusions and recommendations is included, identifying unusual or critical items that should be addressed in the design and construction.

3.11.7.2 Site and Subgrade Preparation - Recommendations concerning clearing, stripping, and grubbing of the embankment footprint area, spillway locations, and potential borrow areas should be included. All disturbance and excavation limits should be based on safety considerations. Typically, the area beyond the toe of the dam is cleared to minimize root invasion.

3.11.7.3 Foundation Preparation - Recommendations concerning undercutting and replacement of unsuitable materials should be included in this section.

Special foundation preparation techniques are included to deal with partial undercutting of alluvial soils and the preparation of exposed rock foundations.

3.11.7.4 Groundwater and Dewatering - Dewatering requirements to construct the project should be identified. Specific areas that will likely require dewatering, and the extent to which groundwater lowering is needed, should be addressed. General information on the anticipated types of dewatering systems that would be appropriate should be presented.

3.11.7.5 Surface Water Diversion - A general discussion of the need to route surface flows from the drainage basin around and through the construction work area should be identified.

3.11.7.6 Seepage Considerations - The seepage evaluations should include estimates of potential seepage quantities, as well as any seepage reduction and seepage collection techniques needed. Seepage reduction techniques such as cutoff/keyways, slurry walls, clay core zones and grout curtains should be identified. Internal drainage system recommendations should be made for any foundation and embankment drains that are needed. Details concerning gradations of drainage aggregates, filter requirements, the need for special items such as relief wells, and locations and minimum dimensions for drainage components should be addressed.

3.11.7.7 Embankment Geometry - The maximum recommended slope inclination should be specified based on the results of the stability evaluation. The need for toe berms, wave berms, and minimum crest widths should be discussed as well as drainage considerations for the surface of the embankment. Any requirements for zoning within the embankment should be included, specifically addressing material properties that are considered appropriate for each zone within the dam.

3.11.7.8 Earthwork Recommendations - This section of the report should include the material types and quantities identified in potential borrow areas. It should specify minimum compaction requirements and moisture control for all fill material placed during construction. Borrow site management should be addressed. Details concerning the placement procedures for the earthwork operations to assure adequate bonding between lifts, control of overly wet, dry or frozen materials, cross slopes, and management of the fill pad should be provided. Minimum testing recommendations for the earthwork should be included.

3.11.7.9 Settlement - Estimates of settlement, particularly at critical structure locations, should be provided if compressible foundation conditions exist. In conjunction with the settlement assessment, anticipated settlement along

conduits and the associated joint extensibility for any jointed conduits should be described. The potential for excessive differential settlement should be discussed as well as any special foundation preparation techniques or design requirements, such as internal drainage systems and chimney drains. Typically, the settlement estimated at the base of the dam, as well as the settlement within the fill material should be provided. The need to compensate for any potential settlement, including cambering of the crest, special construction sequencing and surcharging requirements should be addressed.

3.11.7.10 Principal Spillway/Conduits - Any special embedding requirements for conduits that will penetrate the dam should be addressed. This would include concrete cradle requirements, filter collars, the need for camber in the pipe to accommodate settlement, and special backfill requirements adjacent to conduits. Allowable bearing pressures for outlet structures should be provided along with any special foundation preparation techniques appropriate for these areas.

3.11.7.11 Emergency/Open Channel Spillways - Items related to the excavation of any open channel spillways in the abutment areas should be addressed. The erodability index of materials exposed at the proposed finish grade should be determined for use in erosion calculations. The suitability of using excavated materials in the embankment, groundwater considerations, and the potential for difficult excavation should be considered. Armored spillway channels in abutment areas or on the embankment should provide details concerning seepage reduction and underdrainage system requirements.

3.11.7.12 Erosion Control - The need for shoreline wave protection, vegetative cover, berms, and protection of critical areas from surface runoff should be considered. Recommendations for positive erosion protection techniques such as riprap should include the bedding requirements for these materials.

3.11.7.13 Other Considerations - Any special requirements for items such as slurry walls, foundation grouting, and special consideration of the geology in which the site is located should be addressed in the geotechnical report. In essence, any geotechnical issues, which may impact the subsequent design and construction of the project, should be considered.

3.11.8 Instrumentation

Minimum instrumentation requirements should be included in this section. These recommendations should include types of instrumentation, locations, and the general approach to be used in monitoring and reporting the data.

3.11.9 Construction Monitoring

The report should address requirements related to the geotechnical evaluation and construction materials testing that will be required during construction. This includes the level of experience of the individuals responsible for testing and monitoring, general testing requirements, and identification of the specific areas that require monitoring. For large, high hazard dams, full-time monitoring of all phases of the construction is required.

3.11.10 Appendices

3.11.10.1 Supporting Data - All of the field and laboratory test results should be included as appendix items. Exploration location plans, subsurface profiles, boring records, laboratory test results, and any special details should be included.

3.11.10.2 Analyses - The actual calculations required for stability, seepage and settlement, as well as any other specific geotechnical calculations performed as part of the basis for the geotechnical study, should be included. This may be as an appendix item to the geotechnical report or may be submitted as a separate document along with the geotechnical study.

Hydrology
and
Hydraulics

Section 4
HYDROLOGY AND HYDRAULICS

4.1 Introduction

A spillway system must be capable of safely passing the runoff from the design storm event without the embankment overtopping and failing. The magnitude of the design storm depends on the hazard classification. A hydrologic analysis of the watershed and a hydraulic evaluation of the spillways are required to design an appropriate spillway system and determine the minimum crest elevation of the embankment.

The hydrologic analysis involves the computation of the runoff hydrograph. The hydraulic evaluation includes reservoir routing and the computation of elevation-discharge data for both the open channel and closed conduit spillways. Although this differentiation is not universal in civil engineering, it will be used in these guidelines.

Spillway design is an iterative process that involves routing the runoff hydrograph through the reservoir and a trial spillway system. The objective of this process is to design a spillway system that will safely pass the runoff from the design storm without overtopping the dam. Other objectives include designing a spillway system that is economical, dependable, and can be constructed with locally available materials.

The information in this section discusses some of the basic elements of a hydrologic and hydraulic analysis that the Project Engineer will find useful in designing or evaluating a spillway system for a dam. The methods referred to in this section are not exhaustive. Specific analytical methods should be determined on a case-by-case basis. Pre-design meetings between the engineer and the Division of Water are encouraged.

4.2 Hydrology

The design of a new spillway system and the evaluation of an existing spillway require the engineer to compute a runoff hydrograph. Parameters used in the computation of a runoff hydrograph include the watershed area, total rainfall, rainfall distribution (hyetograph), time of concentration, initial abstraction, and infiltration characteristics of the watershed.

4.2.1 Methodology

The runoff hydrograph, elevation-discharge data for the spillway system, and an appropriate reservoir storage-indication method of flood routing are used to perform an overtopping analysis of the dam. Flood routing is necessary to evaluate the adequacy of existing spillways and design new spillway systems. The overtopping analysis involves four steps: computing the runoff hydrograph, determining the elevation-discharge relationship for the spillway system (using the methods in Section 4.3), determining the elevation-storage relationship for the reservoir, and routing the runoff hydrograph through the reservoir and spillway(s). When designing

a new spillway, iterations continue until the engineer determines an acceptable top-of-dam elevation and adequate size for both the principal and emergency spillways. Because of the iterative nature of the computations, engineers frequently utilize computer programs to perform hydrologic simulations. Acceptable computer programs include the United States Department of Agriculture (NRCS) DAMS2, SITES, and TR-20 software and the United States Army Corps of Engineers (COE) HEC-1 and HEC-HMS software.

4.2.2 Hazard Classification

The hazard classification of a dam is determined by evaluating the area that would be affected by inundation in the event the dam fails with the reservoir at the emergency spillway crest elevation or the dam crest elevation, in the absence of an emergency spillway. A correlation between the amount of inundation and the hazard classification is summarized in Appendix A. In many cases, the hazard classification of a dam can be determined by a review of current topographic maps and a visual inspection of the downstream floodplain for a distance commensurate with the size of the reservoir. If a breach analysis is required, the methodology described in Section 4.10 should be used.

Over time, development occurs in the area downstream of a dam. In fact, a manmade lake sometimes encourages downstream development. It is therefore prudent for the Project Engineer to consider designing the spillway for a higher hazard classification, when appropriate. This can help the owner avoid major dam and spillway modifications at a later date when the downstream development occurs, the hazard classification increases, and costs for upgrading the dam and spillway system are higher.

4.2.3 Design Storm Events

After the hazard classification of the dam has been determined, the appropriate design storm is selected using the criteria in Table 1.

If the time of concentration (Tc) is less than 6 hours, the 6-hour Probable Maximum Precipitation (PMP) should be used to analyze the spillway system. If the Tc exceeds 6 hours, the design storm duration is increased to a time equal to or greater than the Tc. This increases the PMP depth to account for the longer storm duration. All season 6-hour, 10 square mile PMP isohyetals and 24-hour, 10 square mile PMP isohyetals for the state can be found in Appendix D and in the latest edition of the Indiana Department of Natural Resources (IDNR) - Division of Water Publication "Rainfall Frequency for Indiana." The definition of the PMP rainfall event and its computation are discussed in the Department of Commerce Hydrometeorological Report (HMR) No. 52. If the watershed is greater than 10 square miles, the PMP depth may be reduced using procedures outlined in Hydrometeorological Report (HMR) No. 51.

Table 1: Design Storm Event for Spillway Design and Analysis

Dam's Hazard Classification	Design Storm Event	Remarks
High	100% PMP	For existing dams, a smaller design storm between 50% & 100% PMP may be justified through an elaborate Incremental Hazard Evaluation procedure described in TADS module "Evaluation of Hydrologic Adequacy".[1]
Significant	50% PMP	
Low	100-Year to 50% PMP	The spillway design storm requirements may vary from the 100-Year storm (for in-channel, low head dams which will be completely inundated by the 100-year storm event) to the 50% PMP (for normal situations, where the downstream hazard is likely to increase from low to significant in the future). A smaller percentage of PMP may be accepted by the Division of Water on a case by case basis, if the consequences of dam failure can be demonstrated to be negligible or assurance in the form of a deed restriction, covenant, etc. is provided to the Division of Water prohibiting new development within the dam breach inundation zone.

NOTE: [1] Information regarding this publication may be obtained from the Division of Water . The owner and engineer should recognize that dam construction typically results in higher risks. If an Incremental Hazard Evaluation procedure is utilized, the owner should periodically evaluate the downstream area to determine if this evaluation is accurate as new development takes place. The owner may eventually be required to modify the dam and spillway to safely pass the runoff from the 100% PMP, if such analysis indicates that the earlier results are no longer valid due to new development occurring downstream.

The 6-hour PMP hyetograph is derived using the NRCS Type B distribution while the 24-hour PMP hyetograph is derived using the NRCS Type II distribution. Both distributions are shown in Appendix D. Other rainfall distributions may be used to develop the design hyetograph. The Project Engineer is encouraged to meet with the Division of Water staff to discuss the use of other methods.

4.2.4 Watershed Area

Watersheds should be delineated on USGS 7½ minute topographic maps in accordance with recognized USGS delineations in the booklet, “Drainage Areas of Indiana Streams” to determine the size, shape and relief of the area contributing runoff to the reservoir. Watersheds are divided into sub-watersheds when appropriate

(see http://in.water.usgs.gov/cdfactsheet/index.shtml) for use in delineating watershed boundaries. The engineer should consider dividing the watershed into sub-watersheds when the area above the dam is greater than 2000 acres or the sub-watersheds have significantly differing characteristics such as slope, land use, soil types, or shape.

4.2.5 Time of Concentration

There are numerous methods that can be used to compute the time of concentration. The size, shape, and geomorphology of the watershed are key factors that should be examined in detail before selecting a method. The surface runoff path should be divided into subreaches depending upon type of flow (sheet-overland, concentrated, gully, storm sewer, culver, ditch, stream, or channel), land cover, and slope. The kinematic wave method may be applied to calculate travel times from the point of entry into the lake, through the reservoir, and to the spillway outlet. Travel time calculations for each subreach should be provided and the total travel time indicated. Parameter limitations of each method should be examined before a method is selected. The following are a list of methods frequently used to compute the time of concentration:

- NRCS TR-55 Method (computes Tc directly by dividing the watershed into flow segments for both overland and channel flow; travel times for each segment are summed from the most hydraulically remote point in the watershed to the reservoir)
- NRCS Upland Method
- Kinematic Wave Method (computes Tc directly by dividing the watershed into flow segments for both overland and channel flow; travel times for each segment are summed from the most hydraulically remote point in the watershed to the spillway outlet)

Other Tc methods are acceptable. Documentation for the method used to determine the Tc should be included in the engineering report and should include the equation(s) and the design methodology (see Section 4.11).

4.2.6 Rainfall Losses

Initial abstraction and infiltration are deducted from the total rainfall to derive the runoff hydrograph. In the absence of site-specific data, lumped parameter models such as the NRCS Runoff Curve Number Method (*National Engineering Handbook*, Section 4, *Technical Release 5*, or *Engineering Field Handbook*, Chapter 2) can be used. The NRCS Runoff Curve Number Method is a methodology that determines losses and initial abstraction on the basis of soil types and land use. As a minimum, curve numbers should be determined for antecedent moisture condition (AMC) II. The engineer should consider projected land use changes in the computation of the curve number. Design documentation will include soil types, land use, maps, and the

methodology used in calculating the curve number (see Section 4.11). The COE HEC-1 and HEC-HMS programs include other loss rate methods that are acceptable.

4.2.7 Hydrographs

Because smaller watersheds in Indiana are ungaged, the use of synthetic unit hydrographs is an accepted procedure for the computation of runoff hydrographs. Synthetic unit hydrographs are based on the assumption that watersheds within a homogeneous region have similar rainfall-runoff characteristics. The NRCS dimensionless unit hydrograph is typically used and is valid for watersheds up to 50 square miles in size. Larger watersheds can be divided into sub-watersheds less than 20 square miles in size to use the NRCS method. Clark's unit hydrograph, which considers the storage effects of the watershed, and Snyder's unit hydrograph, which considers the physical geometry of the watershed, are useful for analyzing larger watersheds. Snyder's method is valid for watersheds ranging in size from 10 square miles to 10,000 square miles. Other synthetic unit hydrographs may be acceptable but should be coordinated in advance with the Division of Water.

4.2.8 Channel Routing

Large heterogeneous watersheds are frequently delineated into sub-watersheds and stream networks. Runoff hydrographs are derived for each sub-watershed and channel routed through the stream network to the reservoir. The Modified Puls Method and the Muskingum-Cunge Method are typically used to perform the channel routing. The Muskingum-Cunge Method requires knowledge of the physical characteristics of the channel, such as the reach length, cross sections and slope to compute the routing coefficients. Both methods may be used with the HEC-1 or HEC-HMS programs to derive the runoff hydrograph for the watershed.

4.3 Hydraulics

Hydraulic calculations are performed to determine the elevation-discharge characteristics of closed conduit and open channel spillways. Principles of fluid mechanics allow the engineer to analyze weir, orifice and full pipe flow in closed conduit systems, which may include inlet structures, outlet structures, gates, and valves. Open channels are typically analyzed under steady, nonuniform flow conditions to determine the location of the control section and the water surface profile. Transitions from gradually varied flow to rapidly varied flow frequently occur in open channels and the analysis should evaluate the effect of side channel entrances, ogee sections, bridges, geometric transitions, and energy dissipation structures.

4.3.1 Spillways

The design of spillways for a dam project requires consideration of numerous parameters. Among these parameters are the type, size, and location of primary and emergency spillways and the need for inlet and outlet structures. The topography and

soil conditions at a site are important considerations in the design of spillway systems. The need for energy dissipation, erosion control, debris protection measures, and maintenance procedures should be evaluated.

Typically, a dam will have at least two spillway structures, a principal (or primary) spillway and an emergency (or auxiliary) spillway. The combined capacities of the spillways should be able to safely pass the runoff from the design storm without overtopping the dam. The emergency spillway should be an engineered open channel to prevent blockage during the design flood.

Due to the high maintenance costs and the erosion potential of grassed open channel spillways, it is desirable to minimize the frequency of use of the emergency spillway. A typical approach is to design the spillway system so that the emergency spillway only operates for rainfall events greater than the 100-year event. For significant and low hazard structures, the emergency spillway should only operate for rainfall events greater than the 50-year storm.

The emergency spillway (regardless of the type) should be properly protected against erosion in order to provide structural resistance to up-lift, cavitation, vibration, and erosion. Sufficient erosion protection should be provided to prevent the uncontrolled release of reservoir storage below the emergency spillway elevation during the design flood.

4.3.1.1 Principal Spillway

The principal (or primary) spillway controls the normal pool elevation of the lake and should safely handle outflow from the lake under various conditions including freeze/thaw and ice buildup. The principal spillway usually consists of an inlet structure, a closed conduit, and an outlet structure. Ease of access for timely maintenance is especially critical. Principal spillways are frequently located within the embankment although they may be situated in natural ground. Some types of principal spillways include:

- Culvert(s)
- Drop Structures
- Gated Structures
- Labyrinth Weirs
- Morning Glory Inlets
- Ogee Weirs
- Standard Covered Risers

Public safety should be considered in the design of principal spillway inlets and outlets. Barriers should be placed on riser openings and signs posted near inlet structures to warn the public of the hazard posed by spillways.

4.3.1.2 Emergency Spillway

The emergency (or auxiliary) spillway provides additional discharge capacity as the lake level rises to prevent the dam from overtopping during the design storm. The emergency spillway also provides an alternative for safe discharge should the primary spillway become inoperable or blocked.

The outlet slope of the emergency spillway should be greater than the critical slope to cause critical depth (a hydraulic control section) to occur at the spillway crest. Backwater computations should be submitted for a wide range of discharges in order to establish a rating curve and show the depth-discharge characteristics for the entire length of the spillway. Regardless of the spillway slope, it is advisable to compute a water surface profile for the design discharge using the Corps of Engineers HEC-RAS or HEC-2 programs to estimate the maximum velocities in the channel and determine the height of erosion protection required in the spillway.

The emergency spillway is typically an open channel. It should be located in natural ground away from the dam so that during the operation of the spillway, the dam will not be endangered. When this is not feasible, adequate armor protection should be placed on the dam to allow a portion of it to act as an emergency spillway during the design storm. Emergency spillways in natural ground are typically vegetated but may need additional protection if operated frequently or if design flow velocities are excessive. Listed below are types of acceptable armor protection for emergency spillway channels:

- Articulated Blocks
- Concrete Paving
- Gabion Baskets (underlain with a properly designed filter)
- Engineered Riprap

Early coordination with the Division of Water is required when an emergency spillway will be located on the embankment.

4.3.2 Spillway Rating Curves

A rating curve (plot of elevation versus discharge) should be developed for each primary and emergency spillway structure. The rating curves should be combined into an overall rating curve for the reservoir. The engineer should evaluate how the different spillway structures will affect the overall outflow capacity and the ability of the spillway system to safely pass runoff from the design storm.

Design documentation should include the equations used to calculate each of the spillway rating curves and the design methodology. The rating curves should be

provided in tabular and graphical format (elevation-discharge tables) for each of the spillway structures and combination of all structures.

Maximum design flow velocities for the principal and emergency spillways should be computed when designing structures, outlets, and channels. An evaluation of the maximum velocities is necessary to determine if stilling basins or other outlet protection is required. The design of suitable energy dissipation measures is an important consideration for each spillway structure

4.3.2.1 Downstream Channel Conditions

Channel conditions downstream of the dam can greatly affect the discharge capacity and stability of the dam and should be considered in the overall design. In situations where there are restrictions in flow capacity downstream of the dam (due to a roadway culvert, bridge, lake, levee, or a narrow valley cross-section), the restrictions should be evaluated to determine if tailwater conditions exist at the dam and if the tailwater will reduce the capacity of the spillways.

Typical stilling basin and plunge pool energy dissipation designs require that the tailwater elevation for the channel downstream of these structures be known.

The methodology and data required for determining tailwater conditions at spillway outlets can vary depending upon the characteristics of each downstream restriction. Appropriate field data should be obtained for each downstream restriction, in order to accurately determine the resulting tailwater effects. Corps of Engineers programs HEC-RAS and HEC-2 are typically used to calculate backwater profiles for determining tailwater effects. Other methods or software may be acceptable with prior approval from the Division of Water

4.3.3 Force and Energy Considerations

The operation of spillway structures involves the discharge of significant flows for an extended period of time. In the event the forces and energy resulting from flow through the spillway structure are not considered in the selection and design of spillway structures, damage or failure of the structure may occur. This could impact the overall safety and integrity of the dam.

Structural analysis is necessary to determine the effect of momentum forces on the spillway structures during the design storm. The results of the analysis are used to design the structures to withstand these forces. Analysis and design to provide adequate energy dissipation at each spillway outlet is also necessary. Listed below are some types of energy dissipators.

4.3.3.1 Conduit Spillway Energy Dissipators

- Cantilever Plunge Pool
- Impact Basin
- Riprap Basin
- Stilling Basin (with blocks and end sill)
- Chute Blocks

4.3.3.2 Concrete Chute Spillway Energy Dissipators

- Deflector Buckets
- Hydraulic Jump Basin
- Stilling Basin

Earthen emergency spillways are subject to erosion and possible failure during the design storm. If the failure of an earthen emergency spillway could affect the safety or integrity of the dam, or pose a hazard to downstream residents and structures, spillway attack calculations should be provided. These calculations predict the likelihood that an earthen spillway will fail during the design storm based on soil resistance and bulk length. Field and laboratory data should be obtained to perform the spillway attack calculations so that the spillway can be designed to perform safely. The NRCS SITES computer program may be used to assess the erodibility of an earth spillway.

Structural analysis and geotechnical evaluations regarding spillways should be incorporated into the structural design section of the engineering report and submitted with the permit application.

4.4 Reservoir Routing Procedures

The elevation-storage characteristics of the reservoir should be determined from a hydrographic survey of the reservoir, USGS topographic maps, or maps derived from aerial photography. The elevation-storage data should be submitted in both graphical and tabular format.

After the runoff hydrograph, the elevation-storage curve, and the combined spillway-rating curve have been derived, the engineer can perform reservoir routing computations. Reservoir routing refers to the iterative process of balancing inflow volume, outflow volume, and available storage volume for incremental time periods over the duration of the design storm event in order to assess performance characteristics of the reservoir. The Modified Puls reservoir routing method is typically used to route the runoff hydrograph from the watershed through the reservoir and spillway system. Alternatives for various configurations of the dam and spillway system should be evaluated to design a cost effective principal and emergency spillway that will be dependable and safe.

4.5 Freeboard Calculations

All spillway systems must safely pass the design storm without overtopping the dam. The characteristics of the reservoir should be evaluated to determine if freeboard is required. Freeboard is defined as the distance between the maximum elevation of the reservoir during the design storm and the minimum elevation of the dam crest. In certain situations, the length and orientation of the reservoir may increase the height of waves during the design storm. These waves could overtop the dam. The engineer should determine the effects of wave action when appropriate.

On rare occasions, a dam may be designed to allow overtopping to occur during the design storm. Because of the complexity and risk involved in designing a dam to withstand overtopping, the Project Engineer should meet with the Division of Water staff early in the preliminary engineering phase to discuss specific design requirements.

4.6 Structural/Mechanical

Spillway structures, gates, valves, and appurtenant works should be designed to operate efficiently and safely handle all expected flows (normal & infrequent) and loading conditions from the dam. Spillway structures should be designed to allow maintenance and repairs to be accomplished throughout the expected life of the dam.

4.7 Filling Schedule for Reservoirs

In some cases, it may be necessary to fill the reservoir in stages to allow time for the embankment and foundation materials to adjust to the increased hydrostatic loads resulting from the reservoir. A schedule for filling the reservoir should be developed, based on the embankment and foundation performance, as determined by properly installed instrumentation and visual inspections. The following is a typical schedule for filling the reservoir:

- First 1/3 of the pool level – fill rate unrestricted
- Second 1/3 of pool level - no more than 2 feet per week
- Final 1/3 of pool level - no more than 1 foot per week

4.8 Drawdown Time

All dams should have an adequately designed drawdown structure to allow maintenance and accommodate the requirements of the Operation Plan and the Emergency Action Plan. The dam owner should consider the affects of downstream flooding during reservoir drawdown operations

Rapid drawdown situations affect the stability of the embankment and should be considered when designing the dam and lowering the pool. The rate of safe drawdown and the capacity

of the drawdown pipe should be computed by the engineer and documented in both the Operation Plan and the Emergency Action Plan.

4.9 Spillway Materials

Proper selection and design of materials for a spillway system are as important as the capacity. Metal, concrete, riprap, geosynthetics, and high-density polymers are some of the materials available for spillway structures. The anticipated loads, required operations, expected performance, life cost, and the spillway environment should be considered in the selection of spillway materials.

Materials for pipe spillways should be selected carefully. Pipe spillways are designed for pressure flow. Corrugated metal pipe (CMP) joints are not designed to be watertight in high-pressure applications and are not recommended for use in spillway systems. Welded steel pipe is acceptable in low-head applications but cathodic protection should be provided to delay the onset of corrosion. Because of construction issues, past failures, and the lack of long-term performance documentation in spillway applications, the use of polyvinyl chloride (PVC) and high-density polyethylene (HDPE) pipes are not recommended for spillway pipes. Reinforced concrete pipe (RCP) is very durable and is typically used in pipe spillways. Bell and spigot joints with rubber o-ring gaskets provide a watertight joint in most RCP applications. The use of anti-seep collars and/or seepage control diaphragms should be included in the design and construction of conduit spillways through dams.

4.10 Hazard Evaluation and Dam Break Analyses

Properly designed, constructed, and operated dams can be expected to attenuate downstream discharges during flood events. However, failure of a dam during normal conditions or during a flood event can create a potential hazard far greater than that which existed without the dam. The consequences of dam failure should be fully evaluated and analyzed in order to properly identify and define the extent of the potential "hazard zone". The results of these analyses should be used in determining the hazard classification of the dam and developing the Emergency Action Plan procedures.

4.10.1 Dam Break Analysis Methods

The degree of study required to define the impacts of potential dam failures is site specific and will vary depending upon the type and height of dam, size of reservoir, and downstream conditions. In some cases, detailed studies referred to as, "dam break" or "dam breach" analyses, will be required to determine the anticipated downstream hazard zone.

The generally accepted procedure for dam break analysis involves application of unsteady flow and dynamic routing methods. The following computer programs apply this procedure:

- DAMBRK (National Weather Service)
- FLOODWAV (National Weather Service: combines the DAMBRK model with the DWOPER model)

The Corps of Engineers HEC-1 hydrologic model may also be used to perform a dam break analysis to determine downstream inundation areas. The HEC-1 dam break simulation assumes that the reservoir pool remains level while water is released through an incrementally changing triangular, rectangular, or trapezoidal breach in the dam. The HEC-1 model can be used with a river routing scheme to delineate downstream flood zones or in conjunction with the COE HEC-RAS or HEC-2 models to simulate steady, nonuniform flow conditions in the downstream channel and floodplain. When the COE models are used, the hydrologic methods are assumed to be appropriate for the dynamic flood wave. Under most conditions, these assumptions will be approximately true and will provide results that are sufficiently accurate for the determination of the downstream hazard zone. Appropriate care is recommended in interpreting the results of a dam break analysis based on these assumptions. If a higher order of accuracy is necessary, the National Weather Service unsteady flow models should be applied.

4.10.2 Dam Break Analysis Parameters

The accepted methods for determining dam break analysis scenarios require the user to select the dam failure parameters under a variety of failure modes. Table 2 provides typical values for these parameters. The parameters include the size, shape, and time of formation of the dam breach.

The conditions during which the simulated dam breach occurs is a critical component of the analysis. A "sunny day" breach analysis implies that the dam fails as a result of structural, geotechnical or mechanical failure, not as a result of overtopping of the dam. However, it is advisable, when performing a sunny day breach analyses, to assume (at a minimum) that the reservoir pool elevation is at the emergency spillway operating elevation. In the event that the reservoir does not have an emergency spillway or other open channel spillway outflow, the reservoir elevation should be considered to be at the minimum dam crest elevation.

Simulation of a dam break during the design storm is also advisable. This analysis should be considered in situations where there is the potential that the spillway system capacity could be significantly reduced as a result of blockage, operating failure, or some other condition. This dam break scenario assumes that the failure will occur as soon as the reservoir elevation exceeds the minimum dam crest elevation. Careful consideration should be given to the amount of inflow, the reservoir elevation at failure, and the downstream water elevation. If a recent storm event has occurred, downstream conditions may still be fully saturated or at a flood level.

When analyzing a sunny-day breach or a dam break during the design storm event, the flood storage provided by downstream dams may be considered by the engineer if these dams are approved by the state and regularly inspected. If a downstream dam is not approved by the Division of Water or if an approved downstream dam is found to overtop, the water stored by the dam is assumed to be released and included in the analysis.

Table 2: Suggested Breach Parameters for Indiana

Type of Dam	Avg. Breach Width BR (feet)	Breach Side Slope Z	Time to Failure TFH (Hours)
Arch	W	Vertical or Slope of Valley Walls	0.1
Masonry; Gravity	Monolith Width	Vertical	0.1 to 0.3
Rockfill	HD	---	---
Timber Crib	HD	Vertical	0.1
Slag; Refuse	80% of W	1.0 to 2.0	0.1 to 1.0
Earthen "non-engineered"	2HD to 5HD	0.0 to 1.0	0.1
Earthen "engineered"	0.5HD to 5HD	0.0 to 1.0	0.5 to 1.0

Definitions:

BR	Average Width of Breach
HD	Height of Dam
TFH	Time of Full Formation of the Breach
W	Crest Length
Z	Horizontal Component of Side Slope of Breach

4.11 Documentation

The hydrologic and hydraulic design and analysis of a dam consists of extensive technical work. The engineering report should clearly document the programs, assumptions, parameters, equations, tables, graphs, methodology, engineering judgement, results, and recommendations that were used in the evaluation process. When computer programs are used to perform hydrologic and hydraulic computations, copies of the data files should be submitted in electronic format (floppy disk or CD). The engineering report should be submitted with the permit application to facilitate the review and approval process.

Drawings
and
Specifications

Section 5
DRAWINGS AND SPECIFICATIONS

5.1 Introduction

Every proposed dam or dam repair project requires a set of complete drawings (also referred to as plans) and specifications tailored to the project.

The drawings and specifications are based on the results of the technical evaluations (hydrologic/hydraulic, geotechnical, geologic, structural, etc.) described in the previous sections and recommendations in the engineering report. This section lists items which typically are included in a set of drawings and specifications submitted to the Division of Water. This is not intended to be an all-inclusive list, nor will all of these items be required for every project. This list is limited to aspects of the dam and appurtenant structures. Other items such as an erosion control plan and a plan addressing archeological and cultural resources may need to be submitted for review by others. Some of the items in this section may be combined for clarity or simplicity.

Selected plan sheets for an example dam have been included in Appendix E to illustrate the level of detail and completeness required for small to medium size dams. In Appendix F is a list of the Common Pitfalls that render plans and specifications incomplete.

5.2 Construction Drawings Guidelines

It is recommended that drawings be submitted on 24” X 36” sheets.

5.2.1 Title Sheet

5.2.1.1 Location map with North arrow and scale
5.2.1.2 List of drawings
5.2.1.3 Twenty-four (24) hour contact and phone number
5.2.1.4 Owner's name, address, and phone number
5.2.1.5 Engineer's name, address, and phone number
5.2.1.6 Engineer's professional seal
5.2.1.7 Legend & Information

5.2.2 Regional Plan

5.2.2.1 Regional features that the contractor should be aware of during construction (i.e. drainage area, upstream dams, etc.)
5.2.2.2 Location of proposed lake and dam
5.2.2.3 Downstream hazards (buildings, road, etc.) potentially impacted by dam breach

5.2.3 Vicinity Plan

5.2.3.1 Excavation within the area upstream from the toe of the dam should be based on safety considerations. The Project Engineer usually determines the limits of excavation.
5.2.3.2 Disturbance limits
5.2.3.3 Existing topography
- source (aerial, ground survey, data source)

5.2.3.4 Existing features
5.2.3.5 Borrow/spoil areas
5.2.3.6 Property/easement limits and owners/easement holders
5.2.3.7 North arrow and scale
5.2.3.8 Demolition

5.2.4 Site Plan

5.2.4.1 Site grading
5.2.4.2 Existing topography
- source (i.e. aerial, ground-run, data source)
- contour interval 2-5 ft suggested.

5.2.4.3 Existing features
5.2.4.4 Borrow/spoil areas
5.2.4.5 Disturbance limits
- should be based on safety considerations.

5.2.4.6 Property/easement limits and owners/easement holders
5.2.4.7 Proposed structures, spillways and features
5.2.4.8 Demolition
5.2.4.9 North arrow and scale
5.2.4.10 Geotechnical exploration locations
5.2.4.11 Survey control points

5.2.5 Profiles and Sections

5.2.5.1 Dam centerline profile
- subsurface soils/rock borings
- crest profile (showing compensation for settlement)
- seepage collection and drainage features

5.2.5.2 Dam cross sections
- foundation preparation
- embankment zoning
- upstream and downstream slopes
- seepage collection and drainage features
- cut off trench
- roadway on crest

5.2.5.3 Emergency spillway profile
- typical section
- cross sections
- training berm profile

5.2.5.4 Principal spillway profile
- conduit camber
- anti-seep collar
- seepage control diaphragm

5.2.5.5 Seepage reduction
- clay blanket
- keyway
- slurry wall
- grout curtain
- other relevant items

5.2.6 Seepage Collection

5.2.6.1 Drain Types
- chimney drains
- blanket drains
- trench drains
- toe drains
- foundation drains
- filter collar drains
- rock toes
- other

5.2.6.2 Drain Plans

5.2.6.3 Drain Profiles and Sections

5.2.6.4 Drain Details
- outlet headwalls
- cleanouts
- collection pipe
- animal guards

5.2.7 Instrumentation Plan

5.2.7.1 Settlement plate locations

5.2.7.2 Piezometer locations

5.2.7.3 Instrumentation details (as needed)

5.2.7.4 Installation details (as needed)

5.2.8 Structural Plans

5.2.8.1 General Plans

5.2.8.2 Structural sections and details

5.2.8.3 Waterstop details

5.2.8.4 Concrete joint details and locations

5.2.8.5 Trash rack details
5.2.8.6 Spillway slab
- underdrains
- anti-cavitation details

5.2.8.7 Outlet pipe and concrete cradle details
- filter collar

5.2.8.8 Intake structure details
5.2.8.9 Retaining wall
- foundation
- wall drain

5.2.8.10 Lake drawdown pipe

5.2.9 Miscellaneous Details

5.2.9.1 Shoreline wave protection
5.2.9.2 Internal drainage outlet
5.2.9.3 Plunge pool details
5.2.9.4 Rip-rap details
- limits
- thickness
- type
- bedding
- geotextile

5.2.9.5 Gates & Valves
5.2.9.6 Pavement Details

5.3 Construction Specification Guidelines

5.3.1 Site Preparation

5.3.1.1 Reservoir clearing
5.3.1.2 Clearing and grubbing
5.3.1.3 Waste disposal
5.3.1.4 Stripping
5.3.1.5 Demolition

5.3.2 Dewatering and Diversion

5.3.2.1 Diversion of water
5.3.2.2 Removal of water

5.3.3. Earthwork

5.3.3.1 Undercutting
5.3.3.2 Excavation

5.3.3.3 Rock removal
5.3.3.4 Borrow area development
5.3.3.5 Fill material placement
- Compaction

5.3.3.6 Backfilling
5.3.3.7 Rock fill

5.3.4 Foundation Treatment

5.3.4.1 Drilling and pressure grouting
5.3.4.2 Slurry trench
5.3.4.3 Keyways
5.3.4.4 Treatment of rock surface
5.3.4.5 Rock anchors

5.3.5 Conduits

5.3.5.1 Reinforced concrete pressure pipe
5.3.5.2 Reinforced concrete pipe
5.3.5.3 Steel pipe
5.3.5.4 Ductile iron pipe
5.3.5.5 PVC siphon pipe
5.3.5.6 HDPE pipe

5.3.6 Seepage Collection Systems

5.3.6.1 Toe drains
5.3.6.2 Blanket drains
5.3.6.3 Chimney drains
5.3.6.4 Trench drains
5.3.6.5 Foundation drains
5.3.6.6 Filter collars
5.3.6.7 PVC drain pipe
5.3.6.8 Aggregates
5.3.6.9 Geotextiles

5.3.7 Erosion Protection

5.3.7.1 Rip-rap
5.3.7.2 Geotextiles
5.3.7.3 Other
5.3.7.4 Articulated block

5.3.8 Grassing and Vegetation

5.3.8.1 Soil preparation
5.3.8.2 Seeding
5.3.8.3 Mulching

5.3.9 Fencing

5.3.9.1 Fence
5.3.9.2 Gates

5.3.10 Instrumentation

5.3.11 Concrete

5.3.11.1 Formwork
5.3.11.2 Reinforcement
5.3.11.3 Accessories
5.3.11.4 Cast-in-place concrete
5.3.11.5 Precast concrete
5.3.11.6 Roller compacted concrete
5.3.11.7 Waterstops
5.3.11.8 Joint material

5.3.12 Metals

5.3.12.1 Trash rack
5.3.12.2 Structural steel
5.3.12.3 Miscellaneous metals
5.3.12.4 Anchor bolts
5.3.12.5 Handrails

5.3.13 Equipment

5.3.13.1 Sluice gate
5.3.13.2 Valves
5.3.13.3 Weirs
5.3.13.4 Other

Construction Monitoring

Section 6
CONSTRUCTION MONITORING

6.1 Introduction

The best embankment and spillway design can turn out to be a failure without proper construction monitoring. It is critical that the Project Engineer adequately monitor the construction of the dam and the initial filling of the reservoir. It is also important to monitor the performance of the dam following the completion of construction.

6.1.1 Construction Versus Post Construction

The monitoring program for the construction of a new dam, or the remediation of an existing dam, includes both the actual construction work and the initial reservoir filling (refilling). This section of the guidelines deals primarily with the actual construction period.

6.1.2 Project Engineer and other Technical Professionals

The Project Engineer should work closely with the owner and remain involved with the project during construction. As the owner's representative, the Project Engineer should make regular visits to the site. For large projects, the Project Engineer may designate a field engineer to remain on site and monitor all construction work. In most instances, a geotechnical engineer will be actively involved with the project for the design firm, or as a subconsultant to the design firm. The geotechnical engineer will perform many of the construction monitoring activities. A senior geotechnical technician may be assigned to deal with many of the routine aspects of construction such as monitoring clearing and grubbing activities, monitoring foundation preparation, and performing compaction testing, concrete testing, and gradation tests of the filter and drain material. In addition, other engineering disciplines may be involved in project management and structural evaluations.

6.1.3 Level of Involvement

For large projects, the construction operations should be monitored on a full-time basis. The appropriate design engineer should monitor the construction work that will remain part of the completed project. Many of the construction activities require meeting not only minimum performance requirements, but also observing the details of the actual construction. For example, monitoring the earthwork requires more than density testing which provides only an indication of the degree of compaction and the in place moisture content of the fill material. It is important to monitor the placement of the materials in the dam to make sure lift surfaces are properly prepared and material is placed in the zones depicted on the design plans. This can only be determined by full-time observation of the construction activities.

6.1.4 Need for Technical Professional Involvement

Design activities continue through the construction phase. Interpretations of subsurface data, constructability issues, and modifications necessitated by the contractor's experience and equipment mandate that representatives of the design team remain involved throughout the construction process. These individuals are most familiar with the design assumptions and are in the best position to recommend appropriate modifications, if needed.

6.1.5 Adherence to Plans and Specifications

The primary function of the construction monitoring team is to verify that the contractor complies with the approved plans and specifications.

6.1.6 Design Changes/Field Conditions

Situations occasionally occur where the design will need to be altered due to unforeseen field conditions. The Project Engineer can help facilitate a quick resolution to these situations. Changes that are significant will need to be reviewed and approved by the Division of Water prior to the change being implemented. Minor modifications should be reported and documented on the as-built drawings.

6.1.7 Certification

Almost all permits on dams include a condition that requires the applicant to submit as-built plans certified by a professional engineer. The Project Engineer needs to be closely involved in the construction activities to be able to provide such a certification.

6.2 Routine Construction Monitoring Reports

The following is a brief listing of several of the aspects of construction monitoring that typically need to be performed. This should not be considered an all-inclusive list and should be amended or expanded to account for the particular dam being built. Ideally, all aspects of the construction phase should be monitored and reported.

6.2.1 Clearing and Grubbing

The Project Engineer should evaluate the site after the contractor has completed the clearing and grubbing operations to determine that adequate procedures have been followed to allow for subsequent construction. This monitoring should be reported in a daily inspection report.

6.2.2 Subgrade

The Project Engineer should monitor the subgrade and foundation preparation for the dam. This involves items such as stripping, undercutting of unsuitable material (particularly flood plain undercutting), and keyway/cutoff construction. The conditions observed, including items such as depths of excavation and quantities should be documented in the daily field reports. The geotechnical engineer should approve all subgrade areas before fill placement occurs.

6.2.3 Drains

The Project Engineer should monitor all aspects of the internal drain system construction. The internal drainage system may include a number of components such as foundation drains, blanket drains, chimney drains, and collections systems. Since these systems are filtered either with natural materials or synthetic materials, the monitoring should assure that all filters completely enclose more pervious materials, and that the drains extend into the desired material for the proper control of the phreatic surface. Field adjustments to the drain construction are common and should be documented in daily monitoring reports.

6.2.4 Outlet Works

The Project Engineer should monitor the construction of spillway and drawdown pipes, and their associated intake and outlet structures. Intake control structures typically require assessment of allowable bearing capacity and adequate subgrade preparation. Outlet structures commonly incorporate some underdrainage. Conduit alignments may include concrete anti-seepage cradles, as well as filtered seepage collars. The engineer should monitor the configuration of excavations for conduits, and closely assess all backfilling procedures adjacent to this critical area of the dam. Density tests and concrete tests should be conducted and reported. The geotechnical engineer should approve all subgrades for cradles and structures for subsequent construction.

6.2.5 Earthwork

The geotechnical engineer or a qualified representative should monitor all aspects of the earthwork operations on a full time basis. Routine density testing and moisture control should be reported. In addition, the construction techniques utilized by the contractor should be reported and evaluated to assure conformance with the project specifications. The engineer's representatives should verify that all materials placed in the embankment are suitable for their intended use and that proper lift treatment is performed by the contractor to assure adequate bonding of the individual lifts. The engineer's representatives will determine if moisture adjustments are needed at the fill pad prior to fill placement. This may include either wetting or drying the borrow material to achieve suitable moisture content. The engineer's representatives should

assure that the contractor is using appropriate equipment in the grading activities. Reporting would typically include daily inspection reports summarizing the grading activities and the individual density test report.

6.2.6 Instrumentation

The details of the instrumentation program are outlined in Appendix C. Instrumentation may be placed during the construction process or at the completion of the general embankment construction. In many instances, instrumentation will include devices that are intended to be read during the construction process. For example, settlement plates or devices placed at the base of the dam are typically read throughout the construction process. The engineer should observe the installation of all instrumentation, and evaluate data collected during construction. The data should be compared to design projections to determine if any modifications or further assessments are needed.

6.2.7 Construction Photographs

It is considered good practice to take photographs or video recordings of critical aspects of the construction. These may be in the form of regularly scheduled photographs of the work progress, or specific photographs of certain aspects of the construction. The intent is to obtain a permanent record should any difficulties arise during initial reservoir filling or during subsequent operation of the dam. Photographs should be adequately labeled and dated, and are typically maintained in the design engineer's file. In certain instances, copies should be provided to the Division of Water to document unusual situations.

6.3 Special Construction Monitoring Reports

There may be situations where special construction monitoring is needed and the collection and presentation of information is required. Guidelines are presented in Appendix G. In applying these guidelines, the Project Engineer should use good judgement and elaborate upon them as required by the particular geologic/foundation setting and engineering requirements. These guidelines are not intended to be exhaustive and include all items contained in a special report. However, they do provide guidance to formulate a data acquisition program for planning and documenting specialized work.

6.4 Post Construction Monitoring

The purpose of the post construction monitoring program is to provide information regarding the behavior of the constructed or rehabilitated dam. This information is used in conjunction with as-built drawings and construction photographs to evaluate the performance of the newly constructed dam and to compare to historical data for an existing dam. The recorded data is compared to design assumptions for the dam in order to monitor lake filling and provide a means for future monitoring, operations, and maintenance.

6.4.1 As-Built Drawings

A set of as-built drawings should be submitted to the Division of Water following completion of construction and within the time limits specified in the permit. The as-built drawings should include, as a minimum, the following:

6.4.1.1 Approved Modifications - All previously approved design and construction modifications should be incorporated into the final document.

6.4.1.2 Monitoring Program - A monitoring and instrumentation program should be described if one is required.

6.4.1.3 Acceptance Criteria - A list of critical design assumptions and expected behaviors that need to be validated initially and long term should be included.

6.4.1.4 Instrumentation Locations - The location of all post construction monitoring instrumentation should be shown on the as-built site plan.

6.4.1.5 Certification - A written certification from the Project Engineer that the dam was constructed as shown on the as-built plans.

6.4.2 Lake Level

After approval by the Project Engineer, the reservoir drawdown valve may be closed and the process of filling the lake may commence. Adherence to the reservoir-filling schedule should be controlled by operation of the outlet works in order to maintain the differential rise in Lake Level and maintain flow (see Section 4.7). In the event that sudden changes occur which may be indicative of a potential dam failure, the lake level should be lowered and the Division of Water notified immediately. Otherwise, after the lake reaches the normal operating level, the approved maintenance, inspection and operation plan should be initiated.

6.4.3 Physical Condition of Dam

Areas of potential weakness and their effects on dam stability should be identified. Visual observations should be made in conjunction with instrumentation monitoring to adequately assess the safety of the dam. Initial surveillance of the dam's performance should be conducted by the Project Engineer to confirm design assumptions and to evaluate performance. Many unusual or abnormal conditions can be identified by a walking tour of the dam crest, slopes, toe, and abutments. Long-term inspection, operation, and maintenance will be the responsibility of the dam owner.

6.4.4 Instrumentation Readings

Readings that are commonly monitored at a dam site include headwater and tailwater levels, porewater and uplift pressures, crack or joint movement, structural movement, deformation, seepage flow rates, stress and strain of structural members, temperature, and seismic loads. A monitoring and instrumentation program that assigns responsibility to the engineer for data collection, reduction, presentation, and transmittal to Division of Water staff may need to be developed and documented. The program should include the reasons for installation, frequency of monitoring, threshold ranges of instruments, installation logs, calibration data, and initial readings.

All data should be compared with design assumptions for the expected behavior of the dam. If no unusual behavior or evidence of problems is detected, the readings should be maintained for future reference. Threshold readings that indicate the development of potentially hazardous conditions should be established. Action should be taken if the data deviates from expected behavior or approaches the threshold readings, depending on the nature of the potential hazard. Possible actions include:

- Performing detailed visual inspection
- Repeating measurements to confirm behavior
- Notifying the owner's engineer and the Division of Water
- Increasing frequency of measurements
- Designing and constructing remedial measures
- Installing additional instrumentation
- Operating the reservoir at a lower level
- Implementing emergency measures

6.4.5 Photographs

Photographs or videos are useful in documenting the initial site investigation, subsurface excavation, construction, and as-built conditions. They are helpful for providing a historical perspective in evaluating whether or not there has been any change from previous conditions. Photographs and videos should be maintained for future reference in the event remedial or emergency action is required.

Appendix A
Hazard Classification

Revised - February 2010

Rule 3 - Hazard Classification

312 IAC 10.5-3-1 Consideration of hazard classification

Authority: IC 14-27-7.5-8

Affected: IC 14-27-7.5

Sec. 1 (a) The division shall assign whether a dam is classified as:

(1) high hazard;

(2) significant hazard; or

(3) low hazard;

based on best information available.

(b) In making the determination of assignment under subsection (a), the division shall apply existing U.S. Army Corps of Engineers Phase 1 reports and other appropriate documentation.

(c) The division may also consider observations of the dam and the vicinity of the dam, including the risk posed to human life and property if the dam fails.

(1) If an uncontrolled release of the structure's contents due to a failure of the structure may result in any of the following, the dam shall be considered high hazard:

(A) The loss of human life.

(B) Serious damage to:

(i) homes;

(ii) industrial and commercial buildings; or

(iii) public utilities.

(C) Interruption of service for more than one (1) day on any of the following:

(i) A county road, state two-lane highway, or U.S. highway serving as the only access to a community.

(ii) A multilane divided state or U.S. highway, including an interstate highway.

(D) Interruption of service for more than one (1) day on an operating railroad.

(E) Interruption of service to an interstate or intrastate utility, power or communication line serving a town, community, or significant military and commercial facility, in which disruption of power and communication would adversely affect the economy, safety, and general well-being of the area for more than one (1) day.

(2) If an uncontrolled release of the structure's contents due to a failure of the structure may result in any of the following, the dam shall be considered significant hazard:

(A) Damage to isolated homes.

(B) Interruption of service for not more than one (1) day on any of the following:

(i) A county road, state two-lane highway, or U.S. highway serving as the only access to a community.

(ii) A multilane divided state or U.S. highway, including an interstate highway.

(C) Interruption of service for not more than one (1) day on an operating railroad.

(D) Damage to important utilities where service would be interrupted for not more than one (1) day, but either of the following may occur:

(i) Buried lines can be exposed by erosion.

(ii) Towers, poles, and aboveground lines can be damaged by undermining or debris loading.

(3) If an uncontrolled release of the structure's contents due to a failure of the structure does not result in any of the items given in subdivision (1) or (2) and damage is limited to either farm buildings, agricultural land, or local roads, the dam shall be classified as low hazard.

(d) The division may modify an assignment of hazard classification, made previously under this article, if changes in the downstream development affect the potential for loss of human life and property. (Natural Resources Commission; 312 IAC 10.5-3-1; filed Jan 26, 2007, 10:45 a.m.: 20070221-IR-312060092FRA)

312 IAC 10.5-3-2 Reconsideration of hazard classification

Authority: IC 14-27-7.5-8

Affected: IC 14-27-7.5

Sec. 2 (a) This section establishes a process by which a dam owner or another affected person may request reconsideration of a determination of hazard classification made under section 1 of this rule.

(b) The dam owner or other affected person may submit any technical information or reports that were not previously available to the division.

(c) The dam owner's or other affected person's professional engineer may develop and submit a maximum breach inundation area and current damage evaluation assessing the downstream area affected by a dam breach.

(1) If the maximum breach inundation area and current damage evaluation predicts any of the following, the dam shall be classified as high hazard:

(A) Flood depths greater than one (1) foot in any occupied quarters.

(B) Loss of human life may occur.

(C) Interruption of service for more than one (1) day on any of the following:

(i) A county road, state two-lane highway, or U.S. highway serving as the only access to a community.

(ii) A multilane divided state or U.S. highway, including an interstate highway.

(D) Interruption of service for more than one (1) day on an operating railroad.

(E) Damage to any occupied quarters where the flow velocity at the building compromises the integrity of the structure for human occupation.

(F) Interruption of service to an interstate or intrastate, utility, power or communication line serving a town, community, or significant military and commercial facility, in which disruption of power and communication would adversely affect the economy, safety, and general well-being of the area for more than one (1) day.

(2) If the maximum breach inundation area and current damage evaluation predicts any of the following, the dam shall be classified as significant hazard:

(A) Interruption of service for not more than one (1) day on any of the following:

(i) A county road, state two-lane highway, or U.S. highway serving as the only access to a community.

(ii) A multilane divided state or U.S. highway, including an interstate highway.

(B) Interruption of service for not more than one (1) day on an operating railroad.

(C) Damage to any occupied quarters that would not render the structure unusable.

(D) Damage to important utilities where service would be interrupted for not more than one (1) day, but either of the following may occur:

(i) Buried lines can be exposed by erosion.

(ii) Towers, poles, and aboveground lines can be damaged by undermining or debris loading.

(3) If the maximum breach inundation area and current damage evaluation results predict none of the items in subdivision (1) or (2) and damage is limited to farm buildings, agricultural land, or local roads, the dam shall be classified as low hazard.

(Natural Resources Commission; 312 IAC 10.5-3-2; filed Jan 26, 2007, 10:45 a.m.: 20070221-IR-312060092FRA)

The complete text of the IAC section should be reviewed. Up to date regulation can be found at the following URL:

http://www.in.gov/dnr/water/

Appendix B
Emergency Action Plan Outline

This outline has been replaced.
Please refer to the:
"Indiana Dam Safety Inspection Manual"
Part 4 – Emergency Preparedness.

http://www.in.gov/dnr/water/

Also:
Refer to Appendix A –
"Emergency Action Plan templates"
located in Part 4 of the "Manual"

Appendix C
Geotechnical Addendum-Insitu/Field Testing

A. Geotechnical Addendum - Insitu/Field Testing

1. Field Permeability Tests

Field permeability tests are generally considered to be more representative of the hydraulic conductivity of foundation materials and existing embankment materials than are laboratory permeability tests. The field testing techniques may be the only practical means of establishing foundation permeability for certain material types.

Foundation Soil - The in-situ permeability of potential foundation materials may be determined by performing field permeability tests. Selected zones of the foundation profile including alluvial materials, which may be allowed to remain in place, residual foundation soils, and partially weathered rock, are conducive to this technique. The monitoring wells that may have been installed to better establish the ambient groundwater conditions typically can be used for the field permeability test. Bailing or slug tests are typical. Pumping tests or inflow tests may be appropriate where higher permeabilities exist. Monitoring wells should be carefully constructed to assure that the zone of material desired for testing has been isolated within the screened sections of the well by appropriate seals such as bentonite and grout. The field testing technique is generally considered to provide the horizontal permeability values directly, without the need for adjusting vertical laboratory permeability test results. In addition, a broader cross-section of the subsurface profile can be tested by this technique. Care should be exercised in higher permeability situations to assure that the values being measured do not represent the actual well materials involved in the well construction. These field techniques are typically only applicable to zones of material below existing groundwater levels. Therefore, laboratory-testing techniques are generally required for materials above the groundwater level so that saturation of the material can be established prior to testing.

Existing Embankment Fill Materials - Techniques utilized for the foundation soils can be considered for determining permeability values of existing dam embankment fill materials. This procedure is generally only applicable to the materials that exist below the currently established phreatic surface through the dam. Therefore, the existing reservoir would need to be impounded at the time of testing. This technique is generally not applicable where the lake has been temporarily drained.

Foundation Rock - Packer permeability tests are typically performed to determine the hydraulic conductivity of foundation rock. Either single or double packers are commonly employed to help isolate specific zones within the foundation rock profile. In most instances, fractures and discontinuities within the rock control the hydraulic conductivity of the material. However, the test results are commonly expressed as an equivalent permeability over the length of the test section. Relatively short test sections may be employed to help isolate higher permeability zones. As with the monitoring well type permeability tests, care should be exercised to assure that the hydraulic conductivity values being determined do not represent the hydraulic limitations of the packer test equipment.

2. Other Field Tests

Strength Testing - Various field testing techniques may be considered where soft or low consistency foundation materials exist that cannot be accurately modeled by Standard Penetration Testing or undisturbed sampling. The vane shear test is commonly employed in very soft cohesive deposits. Pressuremeter or dilatometer testing may be considered for a broad range of material types and consistencies. Cone penetrometer soundings may also be considered. To some extent, these field testing techniques have evolved as preferable in certain locations and certain geologic settings. These techniques normally would only be considered where direct support of a new embankment on very weak materials is being considered, or to supplement laboratory testing in materials that are difficult to sample.

Geophysical Methods - A variety of geophysical testing techniques are available and may be considered in certain applications. These approaches would typically be applicable to a very limited number of dam projects due to the specialized nature. The most common technique is the shallow seismic refraction survey, which can be useful in profiling difficult excavation materials. The seismic refraction survey would likely have most applicability in a dam study to generally screen potential borrow areas, since this technique can be negatively impacted by existing groundwater conditions. This typically provides a relatively low cost and expedient technique that generally does not require an invasive approach similar to test pits or borings.

Other Tests - Other field testing techniques may be considered for certain specialized applications. One possible test that would fit into this category would be tracer dye testing. This is used principally to determine the flow direction and rate of flow in karst geology.

B. Geotechnical Addendum - Instrumentation

1. Piezometric Levels

The monitoring of piezometric levels may be an important consideration for specific zones within the foundation of a dam during construction and fill placement, and to evaluate the development of the phreatic surface within the embankment during and subsequent to initial reservoir filling.

Locations - Piezometric levels may require monitoring within specific zones of embankment foundations, particularly where extensive low consistency fine grained materials exist or where there are concerns over the development of high pore pressures during embankment construction (end-of-construction stability). In such instances, the monitoring device will typically measure piezometric levels at specific locations. It is typically desirable to measure piezometric levels within the completed embankment as the reservoir fills and steady-state seepage conditions develop. Devices for this purpose typically require a broad vertical zone be monitored as the piezometric levels rise within the embankment. Piezometer locations in the foundation should be concentrated in the flood plain portion of the embankment footprint. Piezometric levels within the embankment will require devices placed at both edges of the crest, at or slightly beyond the downstream toe of the dam, and potentially within the downstream slope, particularly if berms are utilized on taller structures. These devices should be aligned to allow the phreatic surface development to be plotted. Multiple stations

of such instrumentation may be needed on longer embankments.

Observation Wells - Observation wells and open (Casagrande) piezometers may be considered for many applications. These are typically well suited to monitoring the performance of foundations outside the embankment footprint during construction and within the embankment during initial reservoir filling. Short-screened sections are typically utilized for foundation monitoring. Longer screened sections can be utilized to monitor the unconfined phreatic surface within the embankment during initial filling. The observation wells are usually installed within the embankment after the fill is topped out.

Remote Reading Piezometers - These types of piezometers are well suited to monitoring foundation conditions during and subsequent to construction. Both pneumatic and electric vibrating wire type piezometers have been utilized for this purpose. They may be installed in the foundation of a dam prior to embankment construction, with tubing and wires placed in a manner that does not obstruct the subsequent construction. Remote readout locations outside the embankment footprint are typically utilized.

2. Settlement

The settlement performance of a dam and foundation is typically a consideration during and immediately following embankment construction. A typical scenario is a relatively thick compressible zone in the foundation of the proposed dam and settlement estimates performed during design indicate that significant settlements may occur.

Location - The settlement devices should target more compressible foundation zones, particularly in the vicinity of structures such as conduits. This would normally dictate a location within the flood plain area of the dam footprint. The settlement devices are often concentrated along the centerline; however, they may be placed in other areas.

Settlement Plates - Conventional settlement plates with riser pipes are the simplest forms of settlement monitoring device for the foundation. These are generally placed after foundation preparation is completed and immediately prior to commencement of embankment construction. Accurate elevations are obtained periodically during construction. These elevations should be referenced to the project datum. Additional readings are required immediately prior to and subsequent to adding additional sections of riser rod. These devices will create an obstruction to the earthmoving equipment during construction.

Remote Reading Settlement Transducers - Both pneumatic and electric vibrating wire settlement transducers may be considered. These are typically placed at strategic locations with the cables and tubing routed outside the embankment footprint to a stationary readout location. Such devices lessen the obstructions that exist during earthwork, but may not be as reliable.

Surface Monuments - Surface-monitoring points for settlement measurement should be installed immediately after topping out the embankment. These would be placed along the crest of the dam, and be adequately protected.

3. Seepage

The monitoring of seepage quantities during initial reservoir filling, and throughout the subsequent life of the structure, provides useful information on the performance of the dam. This monitoring is typically facilitated by measuring the outflows from the internal drainage system components.

Piped Outlets - Piped internal drainage system components are common. The outlet location should be protected through the use of headwalls, riprap, etc. The exposed portions of the piping system should be durable, and include animal guards. Pipes should also be placed to allow routine measurement of flow. This typically requires that the invert of the pipe be placed at least a foot above the local subgrade level.

Relief Wells - Relief wells into the foundation are utilized on certain projects, particularly for gravity dams. These should be placed to allow for easy monitoring of the outflows and such that they are protected from damage.

Weirs - Seepage monitoring weirs may be considered in applications where seepage outflows exit from non-point sources, such as rock toe drains. The collected seepage should be routed into a small pool upstream of the weir, and sufficient fall should be provided to allow the V-notch weir to perform as intended. Staff gauges are typically required to determine the level of the water in the pool upstream of the weir in conjunction with seepage quantity calculations.

4. Other Instrumentation

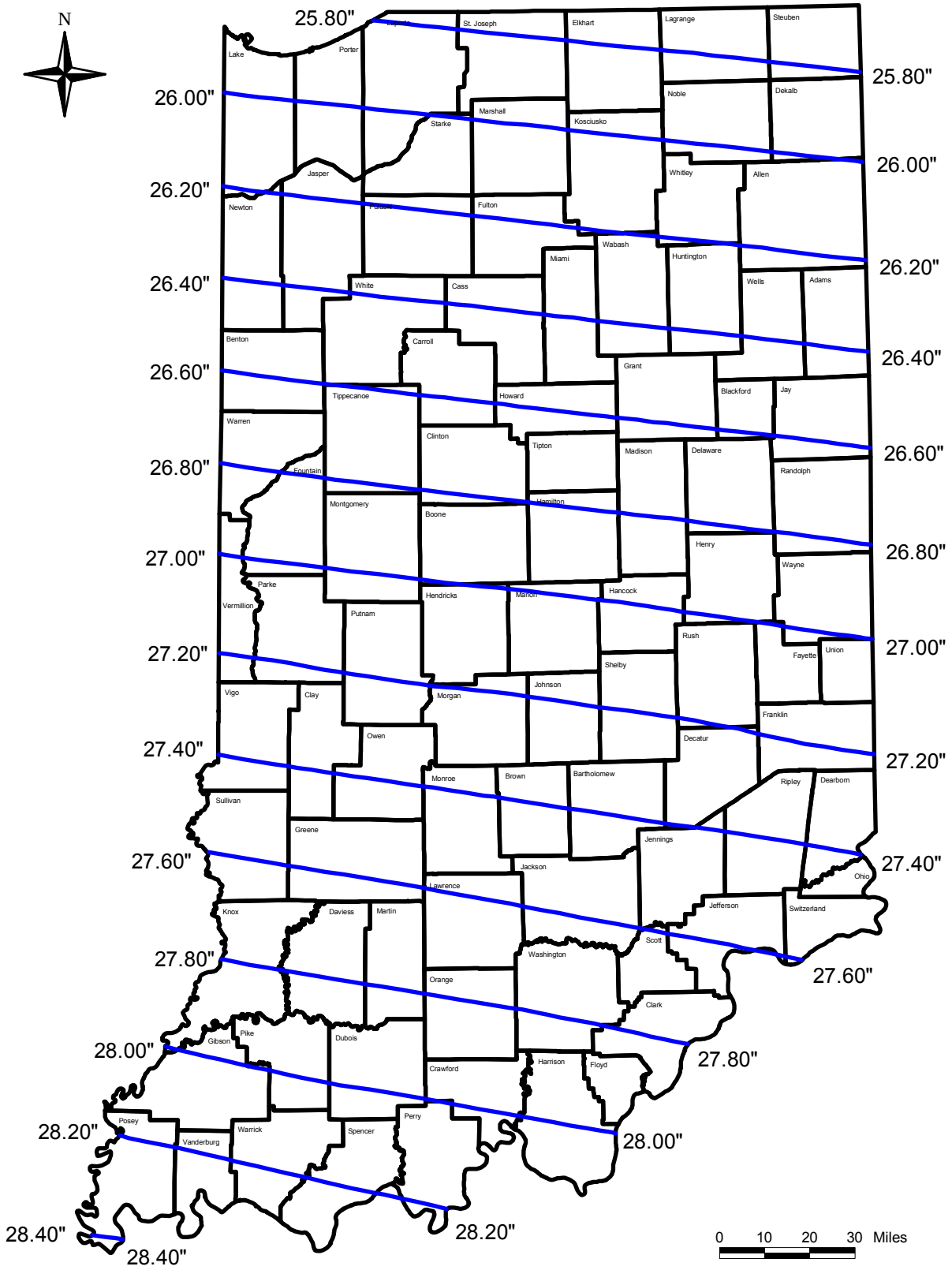
Additional types of instrumentation may be considered in certain special applications. The engineer should determine if specific project requirements dictate the need for specialized instrumentation.

Inclinometers - These devices may be installed in situations where measurement of horizontal movements is required. A fairly common application would be on an existing dam where concerns exist over slope instability.

Crack Monitoring - Crack-monitoring devices may be needed on appurtenant structures, or to evaluate movements across discontinuities of concrete gravity dam sections.

Appendix D
Rainfall Distribution &
Probable Maximum Precipitation

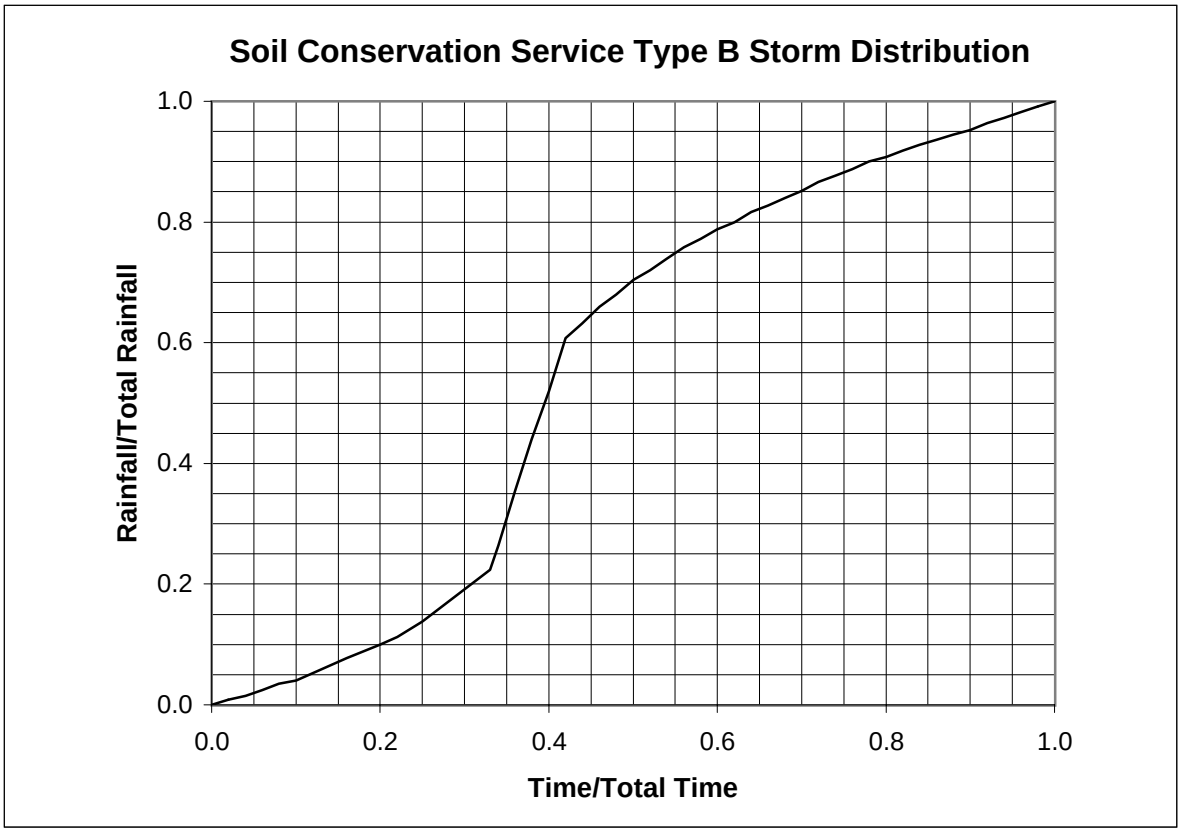
ALL SEASON 6 HOUR PMP FOR 10 SQUARE MILES



REFERENCE
HYDROMETEORLOGICAL
REPORT NO.51
NATIONAL WEATHER SERVICE

STATE OF INDIANA
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WATER

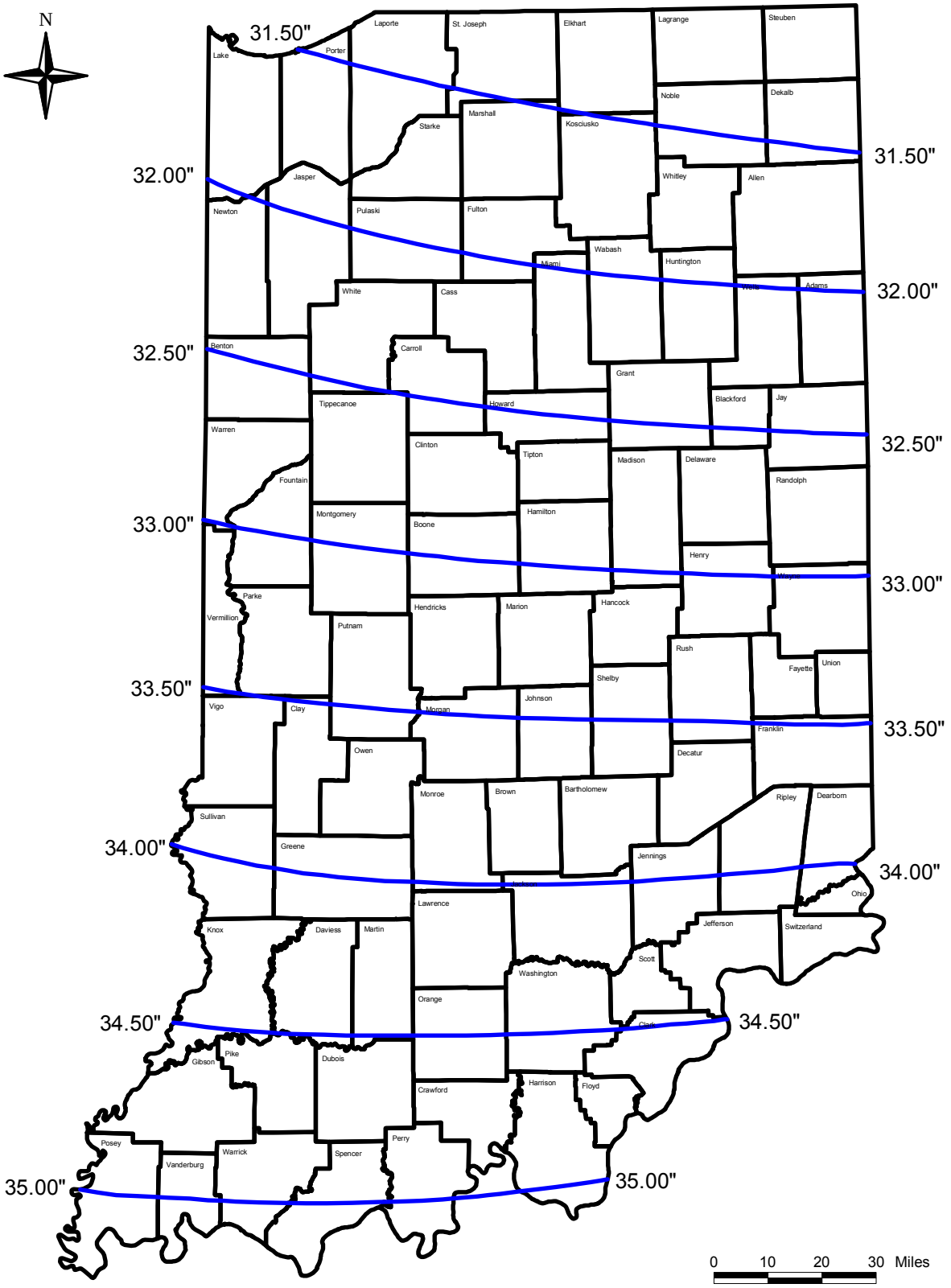
INDIANA DEPARTMENT OF NATURAL RESOURCES



Time/Total Time	Rainfall/Total Rainfall	Time/Total Time	Rainfall/Total Rainfall
0.000	0.000	0.580	0.772
0.020	0.008	0.600	0.788
0.040	0.015	0.620	0.800
0.060	0.024	0.640	0.817
0.080	0.035	0.660	0.827
0.100	0.040	0.680	0.840
0.160	0.077	0.700	0.852
0.200	0.100	0.720	0.866
0.220	0.112	0.740	0.877
0.250	0.138	0.760	0.888
0.330	0.224	0.780	0.900
0.340	0.264	0.800	0.908
0.360	0.354	0.820	0.918
0.380	0.440	0.840	0.928
0.400	0.520	0.860	0.936
0.420	0.608	0.880	0.945
0.440	0.632	0.900	0.952
0.460	0.660	0.920	0.964
0.480	0.680	0.940	0.972
0.500	0.704	0.960	0.982
0.520	0.720	0.980	0.992
0.540	0.739	1.000	1.000
0.560	0.758		

Figure 1. NRCS Type B Rainfall Distribution

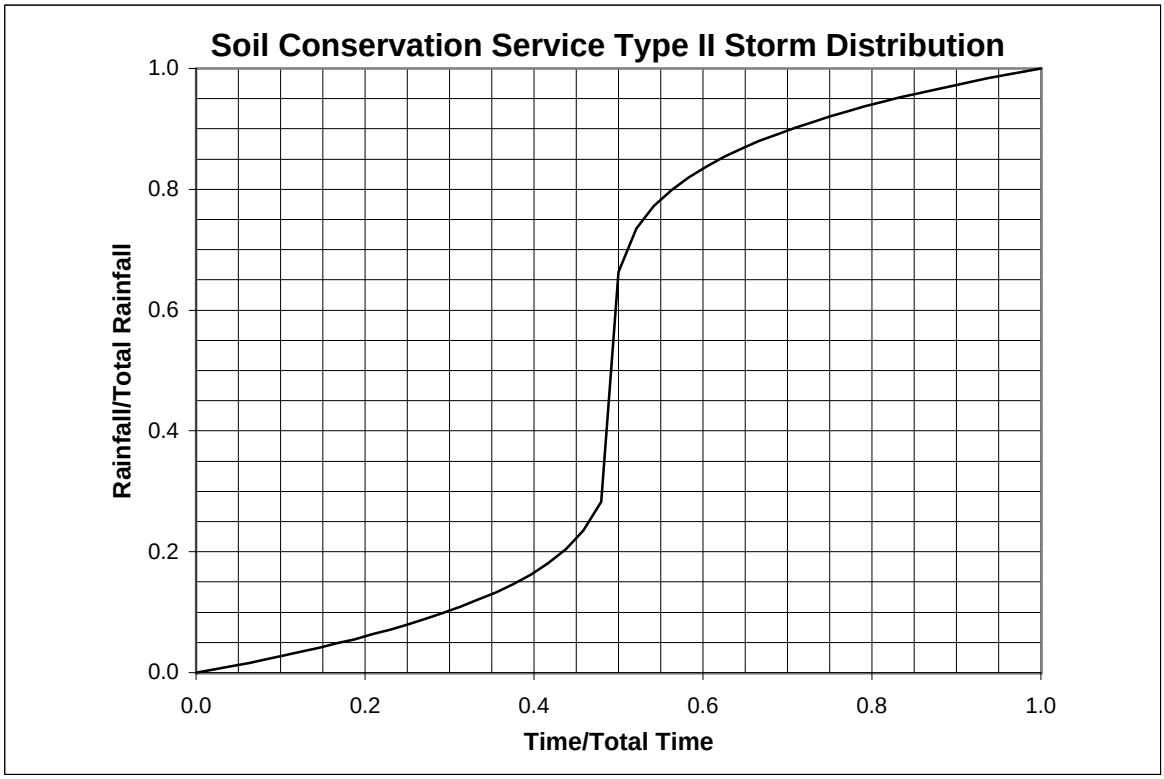
ALL SEASON 24 HOUR PMP FOR 10 SQUARE MILES



REFERENCE
HYDROMETEORLOGICAL
REPORT NO.51
NATIONAL WEATHER SERVICE

STATE OF INDIANA
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WATER

INDIANA DEPARTMENT OF NATURAL RESOURCES



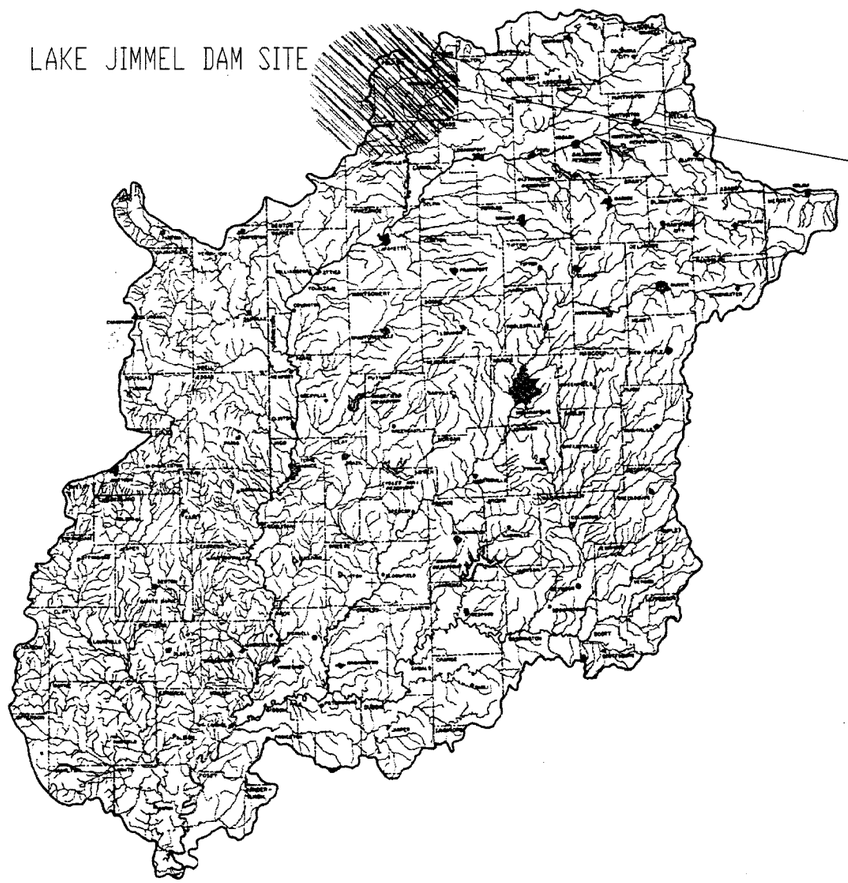
Time/Total Time	Rainfall/Total Rainfall	Time/Total Time	Rainfall/Total Rainfall
0.000	0.0000	0.521	0.7351
0.021	0.0053	0.542	0.7724
0.042	0.0108	0.563	0.7989
0.063	0.0164	0.583	0.8197
0.083	0.0223	0.604	0.8380
0.104	0.0284	0.625	0.8538
0.125	0.0347	0.646	0.8676
0.146	0.0414	0.667	0.8801
0.167	0.0483	0.688	0.8914
0.188	0.0555	0.708	0.9019
0.208	0.0632	0.729	0.9115
0.229	0.0712	0.750	0.9206
0.250	0.0797	0.771	0.9291
0.271	0.0887	0.792	0.9371
0.292	0.0984	0.813	0.9446
0.313	0.1089	0.833	0.9519
0.333	0.1203	0.854	0.9588
0.354	0.1328	0.875	0.9653
0.375	0.1467	0.896	0.9717
0.396	0.1625	0.917	0.9777
0.417	0.1808	0.938	0.9836
0.438	0.2042	0.958	0.9892
0.458	0.2351	0.979	0.9947
0.479	0.2833	1.000	1.0000
0.500	0.6632		

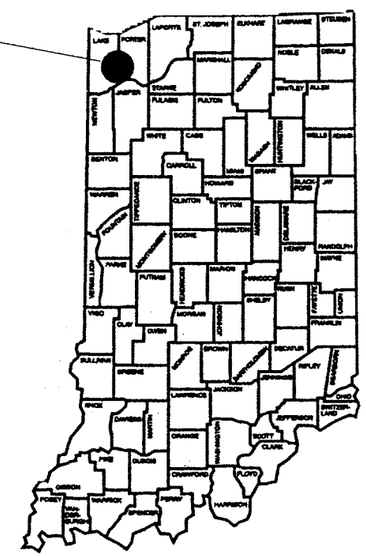
Figure 2. NRCS Type II Rainfall Distribution

Appendix E
Selected Plan Sheets for Illustration Purposes

CONSTRUCTION PLANS
LAKE JIMMEL DAM

LAKE JIMMEL DAM SITE





SUPERB ENGINEERING, INC.
444 WATERSHED DRIVE
OUTLET, INDIANA

INDEX OF DRAWINGS

TITLE	SHEET NO.
COVERSHEET	1
LEGEND AND INFORMATION	2
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VALLEY PROFILE	4
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SEEPAGE CONTROL DIAPHRAGM DETAILS	12
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DETAILS OF 12" DIA. DRAWDOWN KNIFE GATE	14
DETAILS OF R/C INLET TRASH RACK	15

NOTE: OTHER SHEETS MAY BE NECESSARY TO PROVIDE DETAILS FOR THE PRINCIPAL SPILLWAY INLET STRUCTURE, OUTLET STRUCTURE, AND ANTI-SEEP COLLARS.

THE APPROVAL SIGNATURES APPEARING IN THE TITLE BLOCK ON THIS SHEET CONSTITUTE APPROVAL OF ALL DRAWINGS LISTED IN THE INDEX

PREPARED BY: _____

REVIEWED BY: _____

QUALITY ASSURANCE: _____

PROJECT ENGINEER: _____

APPROVED BY: _____

DATE: _____

REVISIONS		
DESCRIPTION	DATE	APPROVED

ENGINEER'S SIGNATURE
DATE, AND SEAL

NOTE: THIS IS A SAMPLE SET OF PLANS-NOT FOR CONSTRUCTION

LEGEND

- County Line
- Township Line
- Section Line
- Property Line
- Base Line
- Centerline of Improvements
- Watershed Boundary
- Sub-Watershed Boundary
- Approximate Limit of Work Area
- Paved Road
- Improved Road
- Private or Field Road
- Bridge
- Railroad
- Fence, Existing
- Fence, to be Removed
- Fence, to be Constructed
- Power Line (location of pole) — Poles
- High Voltage Transmission Line (location of pole)
- Pipe Line or Buried Cable
- Diversion
- Stream, Flow line
- Woodland Boundary
- Building
- Section Corner — 615/718
- Section Center — 5
- Bench Mark, Permanent — × B.M.
- Bench Mark, Temporary — × T.B.M.
- Contours — 570
- Foundation Trench Drain — PIPE
- Clearing and/or Grubbing Boundary — C
- Right of Way Boundary — R/W

GENERAL NOTES

North Arrow is Magnetic North
Elevations of pipes refer to invert elevations
Cross sections shown as looking downstream
Chamfer all exposed concrete edges 3/4"

DEFINITION OF TERMS

S-Grade of channel in feet of drop per foot of length
b-Bottom width of channel in feet
SS-Side Slope, horizontal to vertical
T-Top width of dike, levee or fill in feet
FH-Fill height of dike in feet (vertical distance from bottom of channel to top of dike)
NTS-Not to Scale

EARTHWORK SYMBOLS

- Class of fill — A B C
- Excavation-Common — EC
- Excavation-Rock — ER
- Channel Excavation-Common — CEC

GEOLOGIC INFORMATION LEGEND

Unified classification by Visual-Manual Procedure in the field (ASTM D-2488), except where indicated by *.
Unified classification based on laboratory analysis of selected samples (ASTM D 2487)

UNIFIED SOIL CLASSIFICATION SYSTEM SYMBOLS

COARSE-GRAINED SOILS

GW-Well graded gravels, gravel-sand mixtures little or no fines
GP-Poorly graded gravels, gravel-sand mixtures, little or no fines.
GM-Silty gravels, gravel-sand-silt mixtures
GC-Clayey gravels, gravel-sand-clay mixtures.
SW-Well graded sands, gravelly sands, little or no fines
SP-Poorly graded sands, gravelly sands, little or no fines
SM-Silty sands, sand-silt mixtures
SC-Clayey sands, sand-caly mixtures

FINE-GRAINED SOILS

ML-Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
CL-Inorganic clays of low to medium plasticity, gravelly, sandy, silty or lean clays
OL-Organic silts and silty clays of low plasticity.
MH-Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
CH-Inorganic clays of high plasticity, fat clays.
OH-Organic clays of medium to high plasticity, organic silts.
PT-Peat and other highly organic soils.

CONSOLIDATED MATERIAL

Cng-Conglomerate	Ls-Limestone
Ss-Sandstone	Dol-Dolomite
Sh-Shale	Co-Coal
Sist-Siltstone	Gyp-Gypsum
Ma-Marl	Cht-Chert

OTHER SYMBOLS

- Drill hole logged only
- Drill hole samples
- Dip and Strike
- Pit or trench logged only
- Pit or trench samples
- Ground water level

TEST HOLE NUMBERING SYSTEM

Centerline of Dam	1-99
Borrow area	101-199
Emergency Spillway	201-299
Centerline of outlet structure	301-399
Stream Channel	401-499
Drain Line	501-599
Correlation holes	601-699
Other	701-799

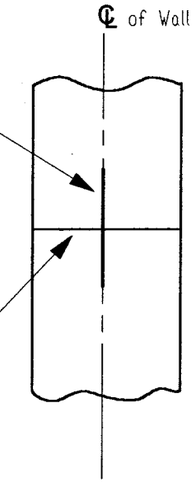
SAMPLE PLOT

102
GP
GM
SP
Ss

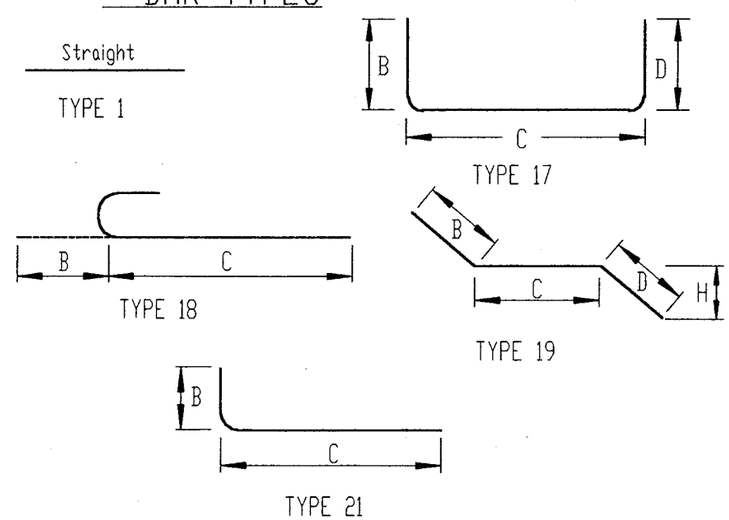
Notes:
1. Geologic investigation made in July, 2000 by Hardrock Exploration, Inc.
2. Ground water levels are as noted at the time of the investigation.
3. Records of the site investigation and geotechnical testing report may be reviewed by prospective bidders by contacting the office issuing the invitation.

DETAIL OF CONSTRUCTION JOINT FOR CONCRETE WALL

1/4" min x 6" steel plate to be continuous throughout construction joint. Where a splice is necessary, the ends shall be butt welded, lapped 3" and fillet welded, or lapped 3" and bolted with a minimum of 2 bolts per splice.



REINFORCING STEEL BAR TYPES

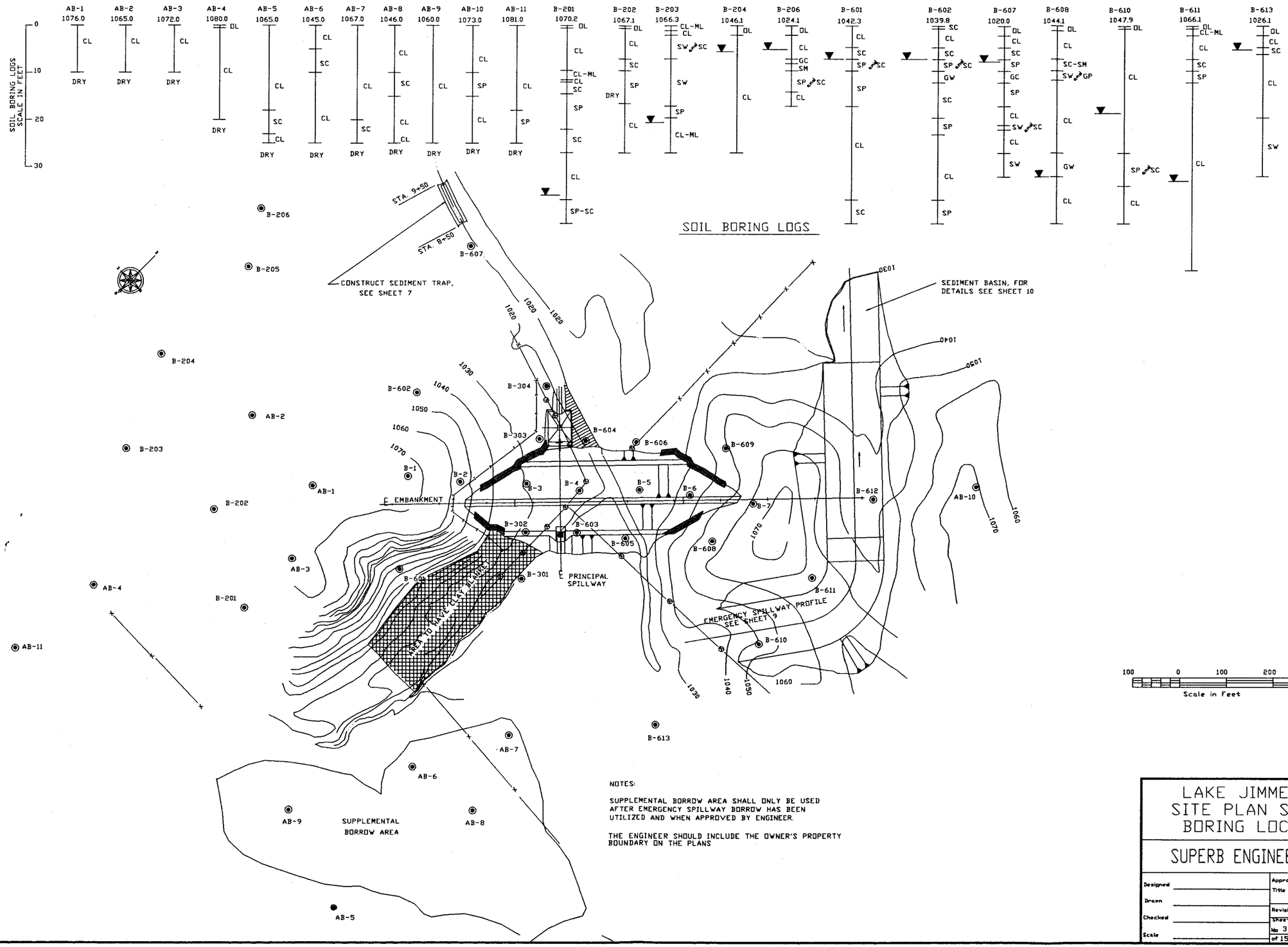


Notes:
1. Steel bending shall meet requirements in ACI Standard 315
2. Steel will be 2" from either inside or soutside face respectively.
3. Steel will be 3" from bottom of apron.

LAKE JIMMEL DAM
LEGEND AND INFORMATION

SUPERB ENGINEERING, INC

Designed		Approved By	
Drawn		Title	
Checked		Revisions	
Scale		Sheet No. 2 of 15	Drawing No.



NOTES:

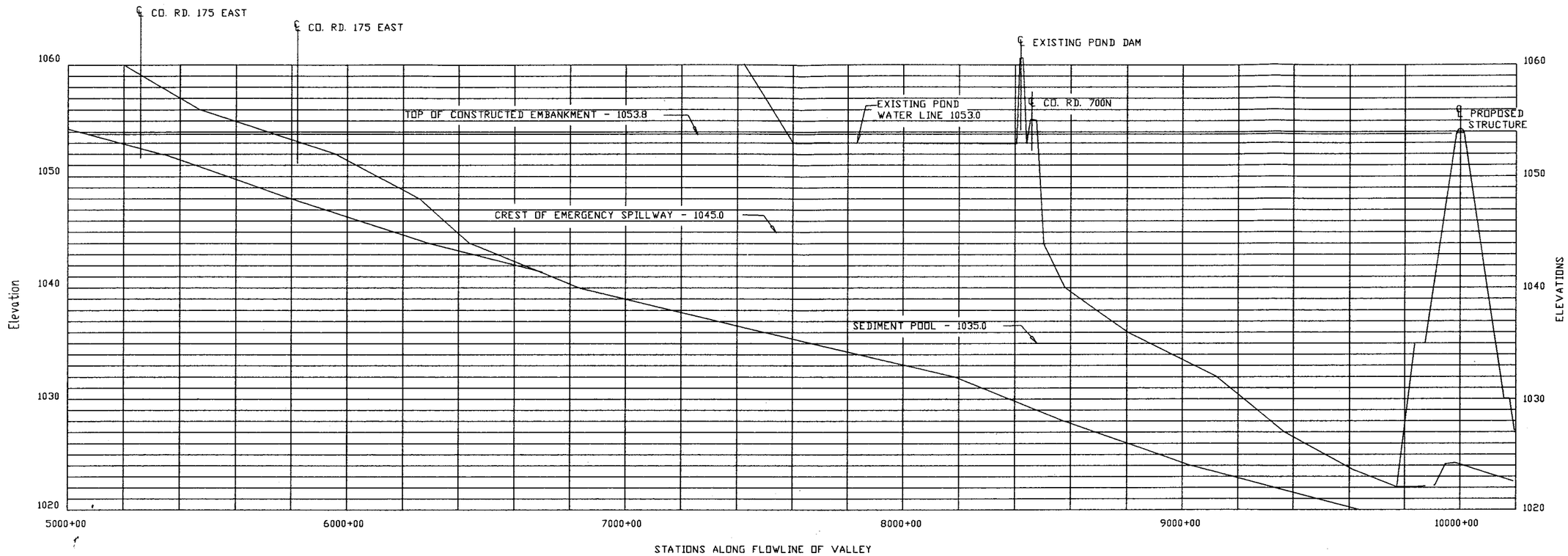
SUPPLEMENTAL BORROW AREA SHALL ONLY BE USED AFTER EMERGENCY SPILLWAY BORROW HAS BEEN UTILIZED AND WHEN APPROVED BY ENGINEER.

THE ENGINEER SHOULD INCLUDE THE OWNER'S PROPERTY BOUNDARY ON THE PLANS

LAKE JIMMEL DAM SITE PLAN SHOWING BORING LOCATIONS

SUPERB ENGINEERING, INC

Designed	Approved By
Drawn	Title
Checked	Revisions
Scale	Sheet No 3 of 15 / Drawing No.



PROFILE ALONG CENTERLINE OF VALLEY

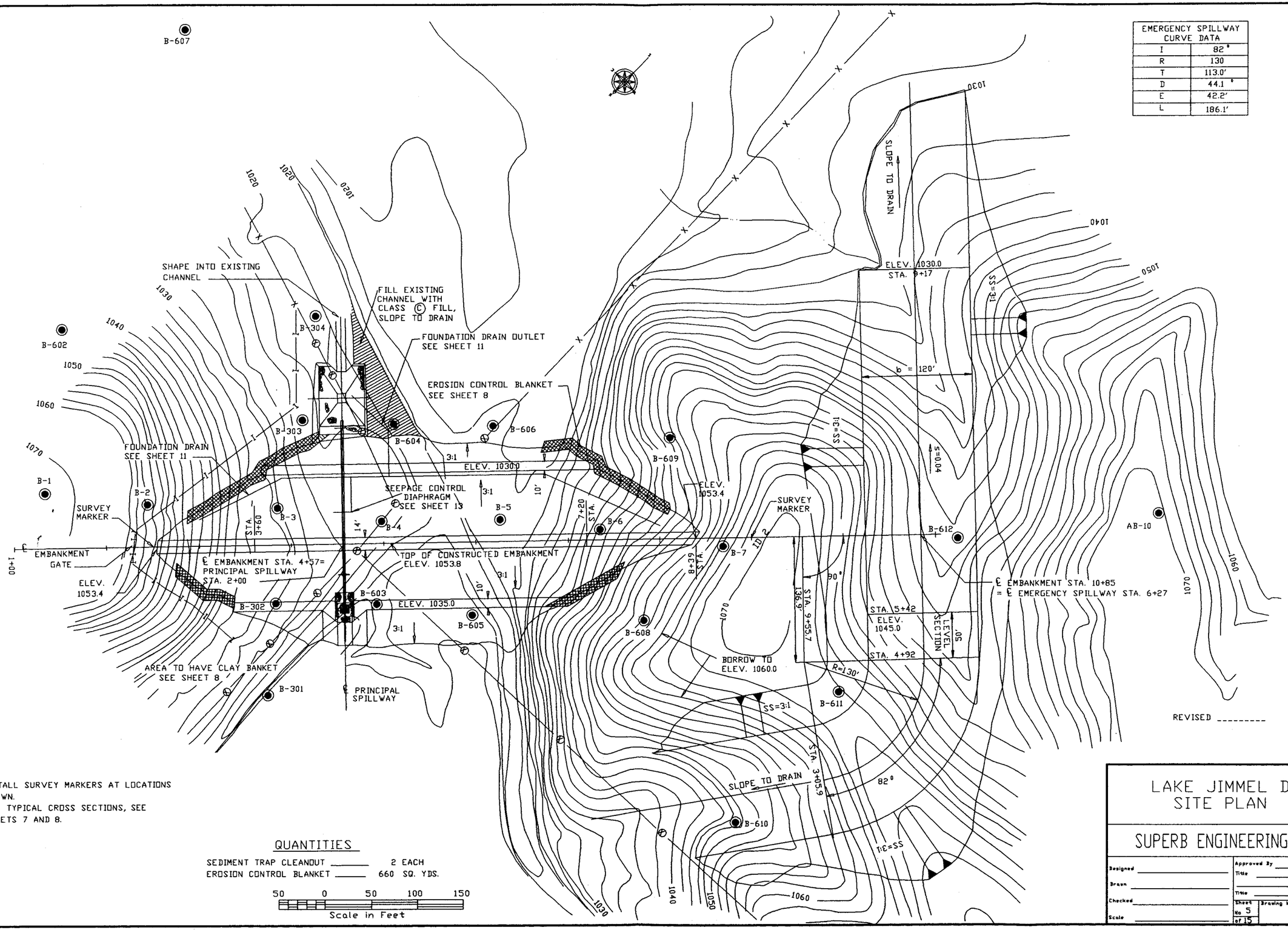
NOTE: UPSTREAM OBSTRUCTIONS SHOULD BE CONSIDERED IN THE DESIGN OF THE DAM AND RESERVOIR.
OBSTRUCTIONS MAY INCLUDE BRIDGES, CULVERTS, DAMS, BUILDINGS, AND ADJACENT PROPERTY

LAKE JIMMEL DAM
VALLEY PROFILE

SUPERB ENGINEERING, INC

Designed	Approved By
Drawn	Title
Checked	Revision
Scale	Sheet No 4 of 15 / Drawing No.

EMERGENCY SPILLWAY CURVE DATA	
I	82°
R	130
T	113.0'
D	44.1°
E	42.2'
L	186.1'



NOTES:
1- INSTALL SURVEY MARKERS AT LOCATIONS SHOWN.
2- FOR TYPICAL CROSS SECTIONS, SEE SHEETS 7 AND 8.

QUANTITIES

SEDIMENT TRAP CLEANOUT	2 EACH
EROSION CONTROL BLANKET	660 SQ. YDS.

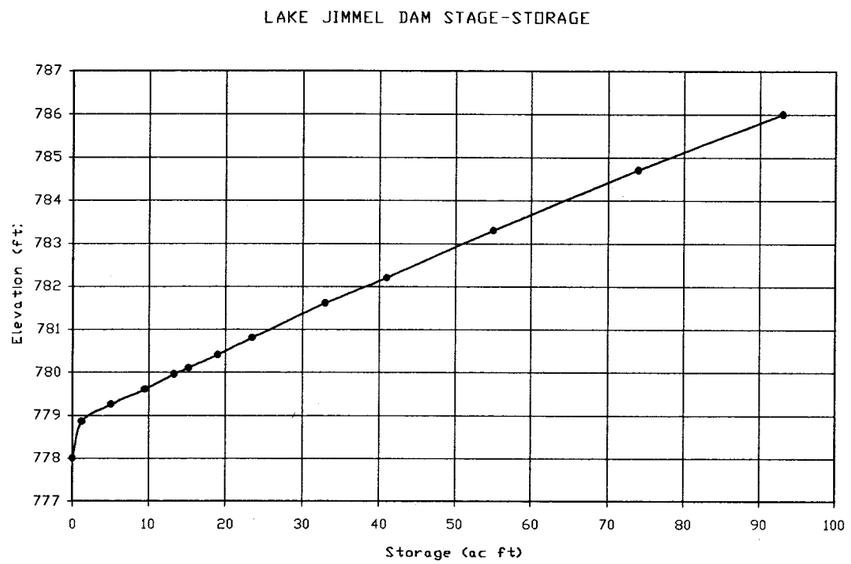
50 0 50 100 150
Scale in Feet

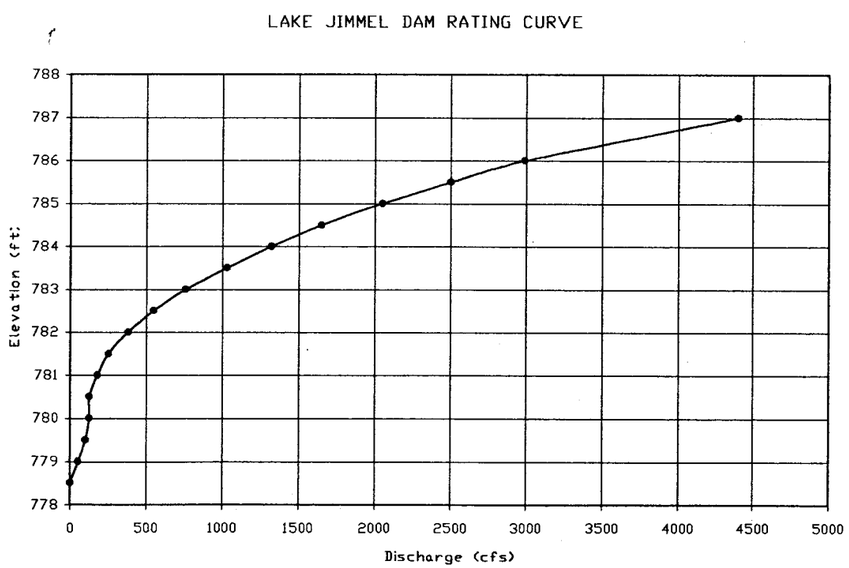
LAKE JIMMEL DAM SITE PLAN

SUPERB ENGINEERING, INC

Designed _____ Approved By _____
Drawn _____ Title _____
Checked _____ Title _____
Scale _____ Sheet No 5 of 15 Drawing No.

HYDRAULIC DATA AND CURVES





PHYSICAL DATA

Hazard Classification _____
Drainage Area (sq mi) _____
Time of Concentration, Tc (hrs) _____
Runoff Curve Number _____
(AMC II Conditions) _____

STRUCTURAL DATA

Principal Spillway
- Material _____
- Length _____
- Size _____
- Height _____
- Width _____
- Crest Elev/Area _____
- Weir Length _____

Emergency Spillway
- Material _____
- Base Width _____
- Side Slope _____
- Crest Elev/Area/Stor _____
- Shape _____
- 'n' value _____
- Length/Slope of Spillway _____
- Armoring _____

Top of Dam
- Elev _____
- Area _____
- Storage _____
- Freeboard _____
- Length of Dam _____
- Channel Outlet Elev _____

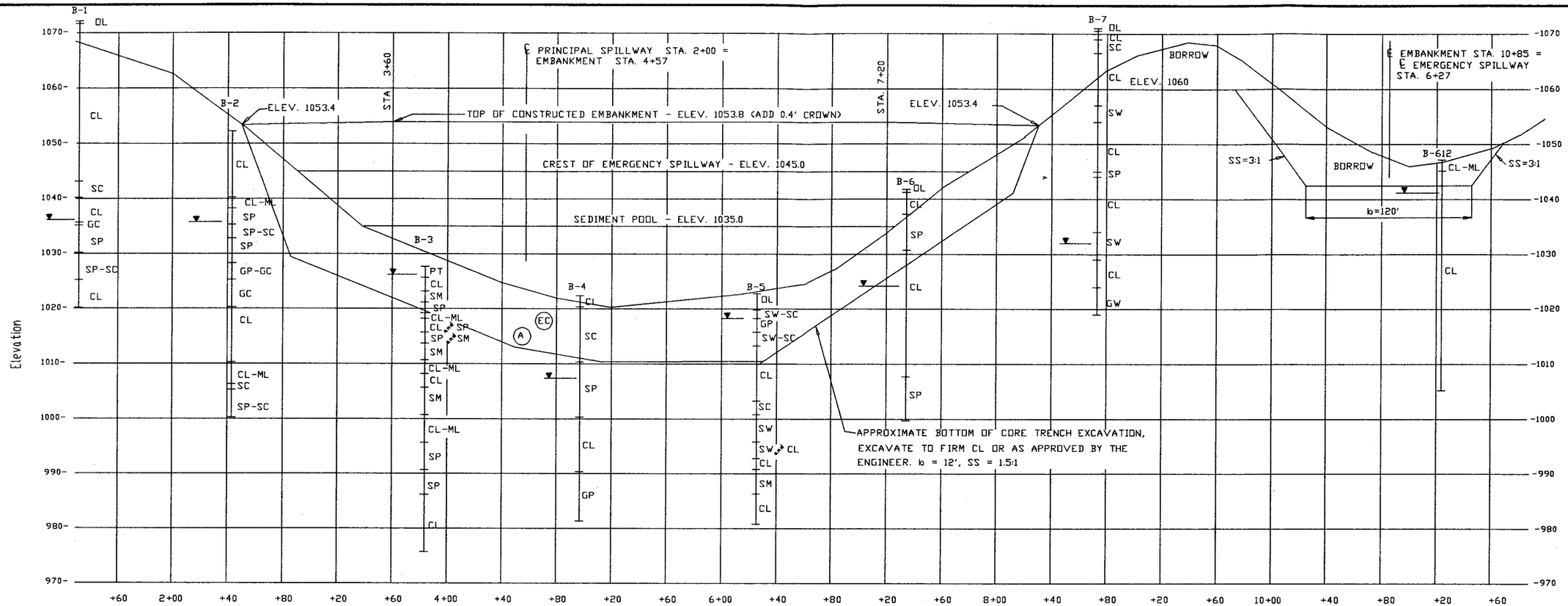
HYDROLOGIC/HYDRAULIC DATA

DESCRIPTION (UNITS)	VALUE
BASIN HYDROLOGY	
Rainfall (in)	
Duration (hrs)	
%PMP or -yr Frequency	
Runoff (in)	
Runoff (acre ft)	
Peak inflow (cfs)	
PRINCIPAL SPILLWAY	
Max. Discharge (cfs)	
Max velocity-at Opening (fps)	
Max velocity-exit channel (fps)	
BREACH ANALYSIS	
Shape of Breach	
Width (ft)	
Sideslope	
Time to Failure (hrs)	
Immediate Downstream Elev (ft)	

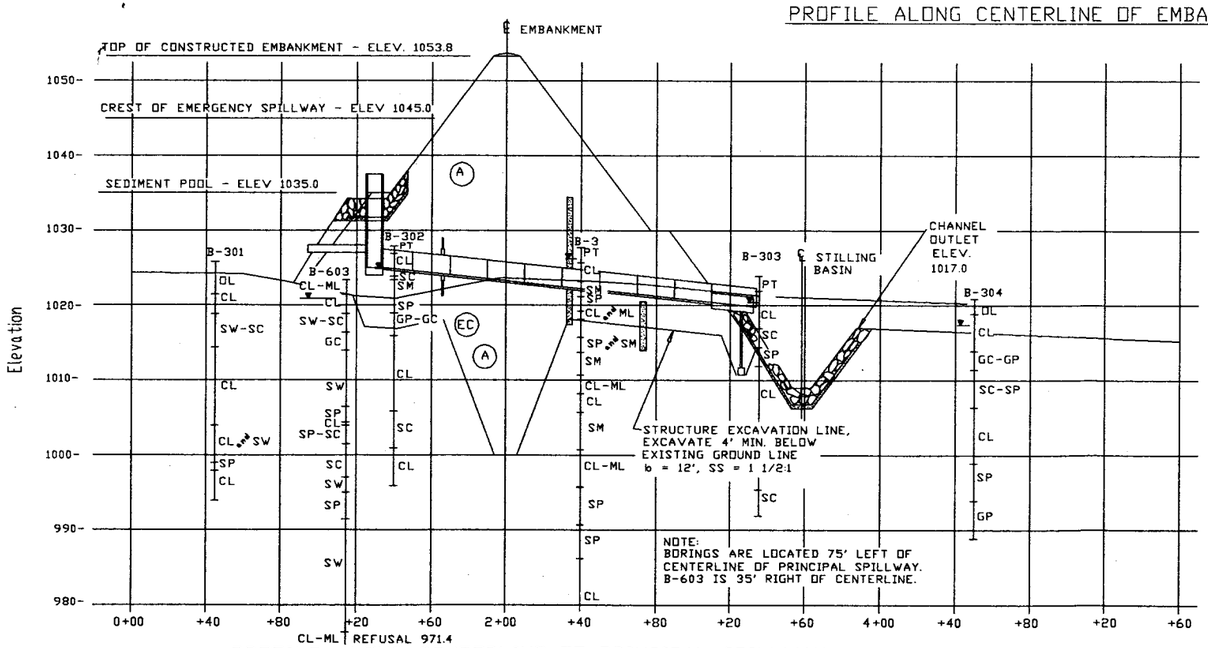
LAKE JIMMEL DAM
HYDRAULIC DATA
AND CURVES

SUPERB ENGINEERING, INC

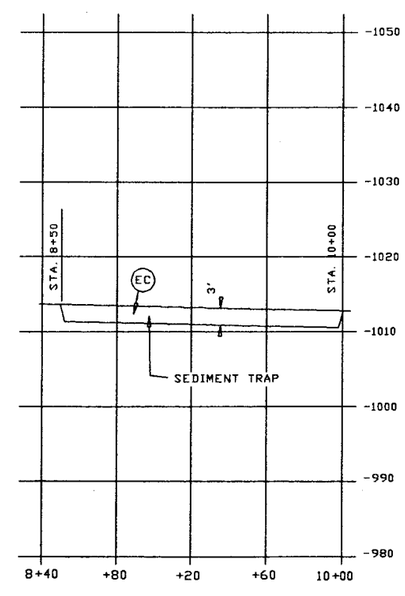
Designed		Approved By	
Drawn		Title	
Checked		Revision	
Scale		Sheet No 6 of 15	Drawing No.



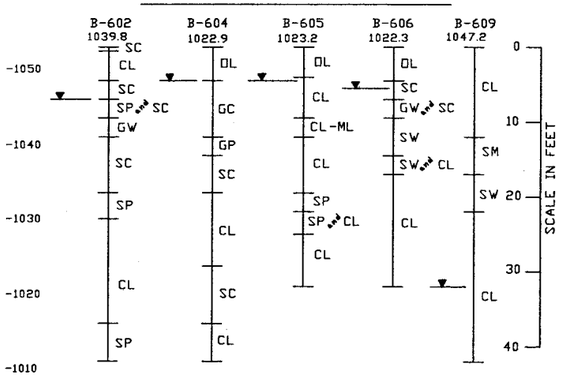
PROFILE ALONG CENTERLINE OF EMBANKMENT



PROFILE ALONG CENTERLINE OF PRINCIPAL SPILLWAY



ADDITIONAL SOIL BORINGS

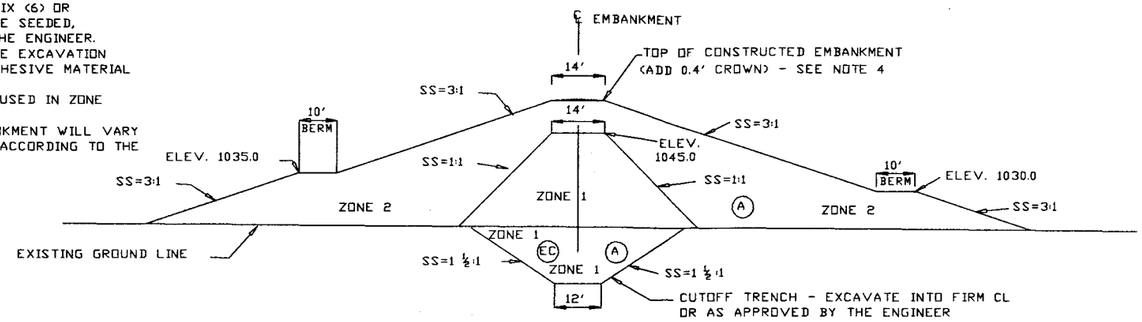


LAKE JIMMEL DAM PROFILES AND SOIL BORING LOGS

SUPERB ENGINEERING, INC

Designed	Approved By
Drawn	Title
Checked	Revision
Scale	Sheet No 7 of 15 — Drawing No.

NOTES:
1 - TOPSOIL SHALL BE PLACED IN THE OUTSIDE SIX (6) OR MORE INCHES OF THE EMBANKMENT AREA TO BE SEEDED, IN HORIZONTAL LIFTS, WHERE DIRECTED BY THE ENGINEER.
2 - BACKFILL FOR CUTOFF TRENCH AND STRUCTURE EXCAVATION SHALL CONSIST OF THE MOST IMPERVIOUS, COHESIVE MATERIAL AVAILABLE.
3 - NON-PLASTIC SP & SW MATERIALS SHALL BE USED IN ZONE 2 AREAS.
4 - ELEVATIONS FOR TOP OF CONSTRUCTED EMBANKMENT WILL VARY ALONG THE CENTERLINE OF THE EMBANKMENT ACCORDING TO THE PROFILE SHOWN ON SHEET 7.

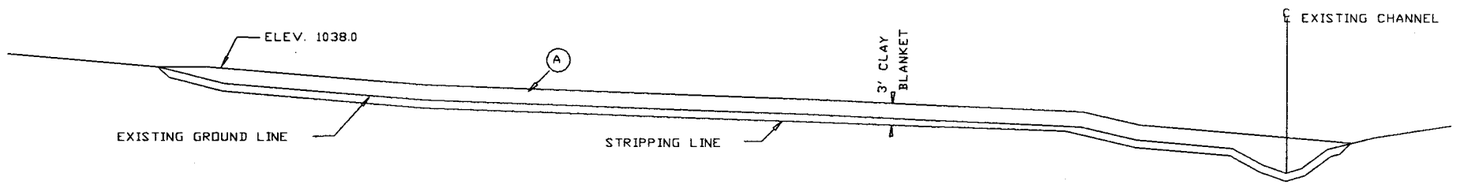


SECTION ON CENTERLINE

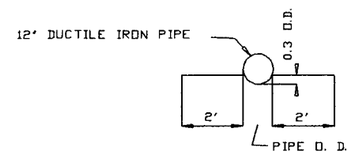
TYPICAL FILL MATERIAL MOISTURE DENSITY RELATIONSHIP

SOURCE OF MATERIAL				LABORATORY TEST INFORMATION		PLACEMENT REQUIREMENT
LOCATION BORING NUMBER	APPROXIMATE DEPTH(FT.) FROM	TO	UNIFIED SOIL CLASSIFICATION	DRY DENSITY (MAXIMUM)	MOISTURE % (OPTIMUM)	EMBANKMENT SECTION
AB-10A	0	10	CL	130.2	10.6	ALL
AB-10B	15	25	CL	133.8	7.8	ALL
AB-5	0	18	CL	121.4	13.9	ALL
AB-8	10	15	SP	140.3	5.8	2
B-611	10	12	SP	*	*	2

* NON PLASTIC SP & SW MATERIALS SHALL BE COMPACTED TO A DRY DENSITY OF 125 LBS./CU. FT. MINIMUM.



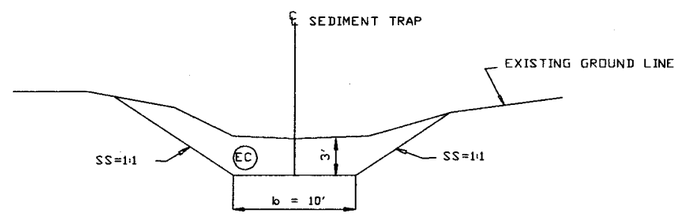
TYPICAL CROSS SECTION OF CLAY BLANKET AREA



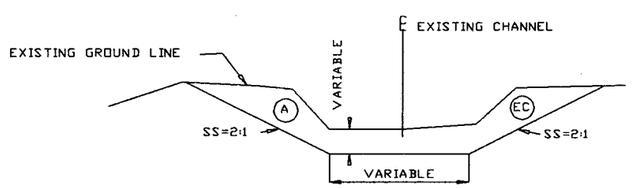
TYPICAL CROSS SECTION OF DUCTILE IRON PIPE PLACEMENT

RIPRAP GRADATION

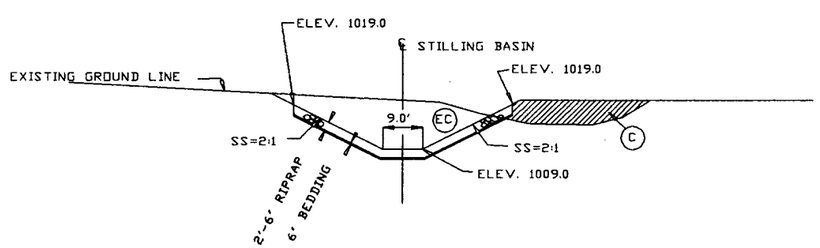
AT LEAST 50% BY WEIGHT SHALL CONSIST OF PIECES LARGER THAN 12 INCHES. THE MAXIMUM SIZE SHALL BE 18 INCHES AND NOT MORE THAN 15% OF THE PIECES BY WEIGHT SHALL BE LESS THAN 4 INCHES.



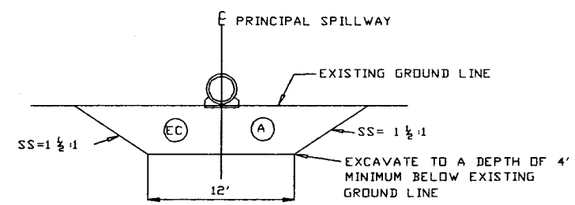
TYPICAL CROSS SECTION OF SEDIMENT TRAP



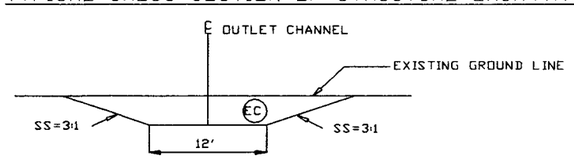
TYPICAL CROSS SECTION OF STREAM CHANNEL CLEANOUT



TYPICAL CROSS SECTION OF STILLING BASIN



TYPICAL CROSS SECTION OF STRUCTURE EXCAVATION



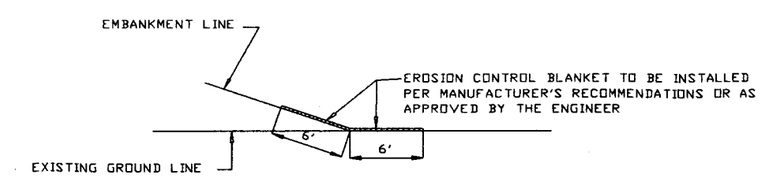
TYPICAL CROSS SECTION OF OUTLET CHANNEL

RIPRAP BEDDING GRADATION

RIPRAP BEDDING SHALL BE INDIANA STATE HIGHWAY COARSE AGGREGATE SIZE NO. 5 OR EQUIVALENT.

QUANTITIES

EXCAVATION - COMMON:		
CUTOFF TRENCH	4,370	CU. YDS
STRUCTURE EXCAVATION	380	CU. YDS.
STREAM CHANNEL CLEANOUT	590	CU. YDS.
OUTLET CHANNEL AND SEDIMENT TRAP	150	CU. YDS.
STILLING BASIN	2,007	CU. YDS.
TOTAL	7,497	CU. YDS.
EARTH FILL - CLASS A:		CU. YDS.
EMBANKMENT	52,250	CU. YDS.
CLAY BLANKET	5,550	CU. YDS.
CUTOFF TRENCH BACKFILL	4,370	CU. YDS.
STRUCTURE EXCAVATION BACKFILL	380	CU. YDS.
STREAM CHANNEL BACKFILL	590	CU. YDS.
TOTAL	63,140	CU. YDS.
RIPRAP	643	TONS
RIPRAP BEDDING	114	CU. YDS.

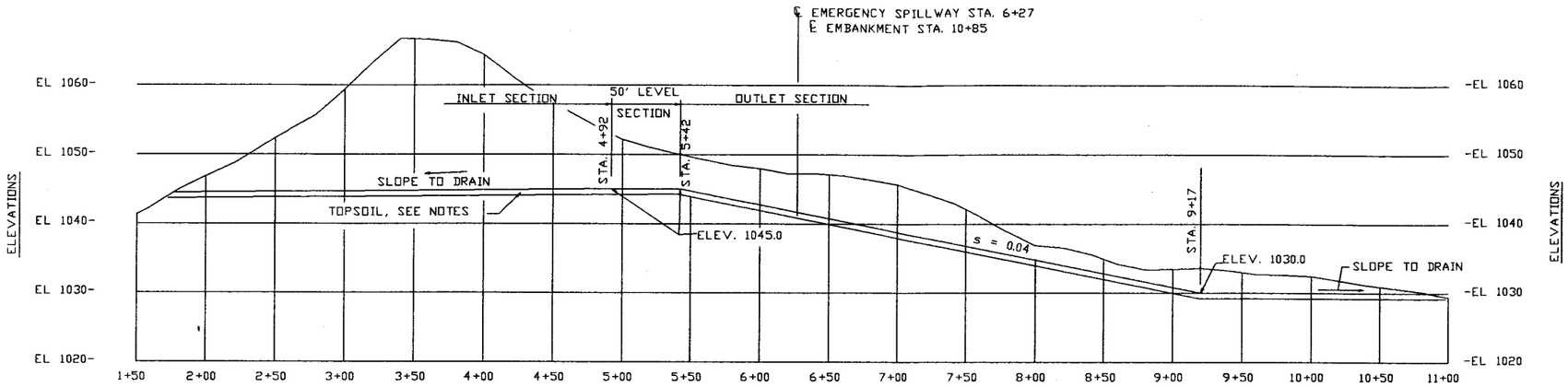


TYPICAL CROSS SECTION OF EROSION CONTROL BLANKET PLACEMENT

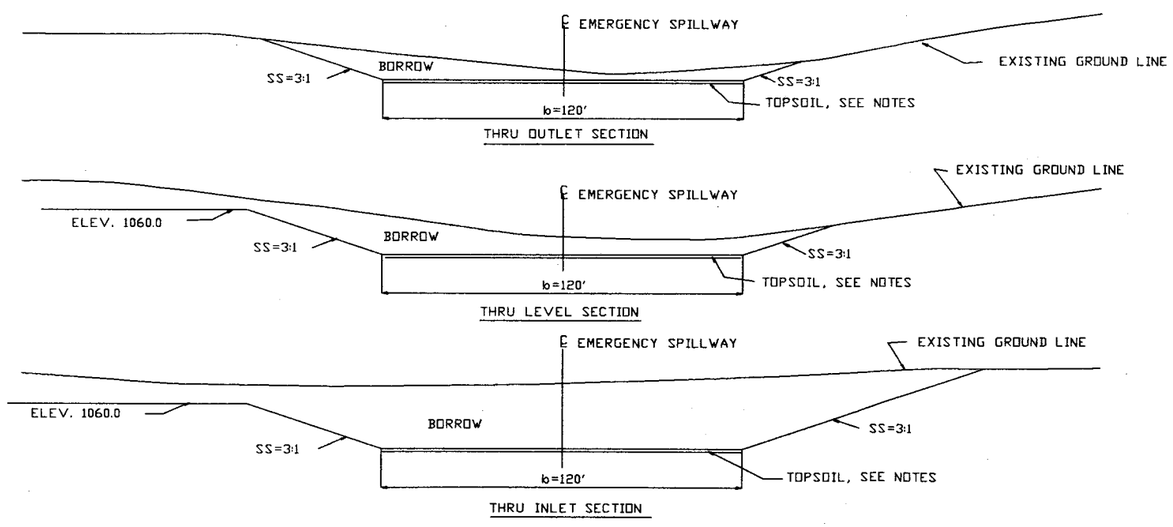
LAKE JIMMEL DAM
TYPICAL CROSS SECTIONS

SUPERB ENGINEERING, INC

Designed		Approved By	
Drawn		Title	
Checked		Revised	
Scale NOT TO SCALE		Sheet No 8 of 15	Drawing No.



PROFILE ALONG CENTERLINE OF EMERGENCY SPILLWAY



TYPICAL CROSS SECTIONS

NOT TO SCALE

NOTES:

1- PLACE TOPSOIL IN EMERGENCY SPILLWAY BOTTOM, 1 FOOT MIN THICKNESS. AREAS WHERE SP AND SW MATERIALS ARE ENCOUNTERED WILL BE EXCAVATED TO A DEPTH OF 2 FEET AND BACKFILLED WITH COMPACTED FILL MATERIAL.

2- THE REMAINING AVAILABLE TOPSOIL SHALL BE SPREAD ON THE EMERGENCY SPILLWAY, WHERE DIRECTED BY THE ENGINEER.

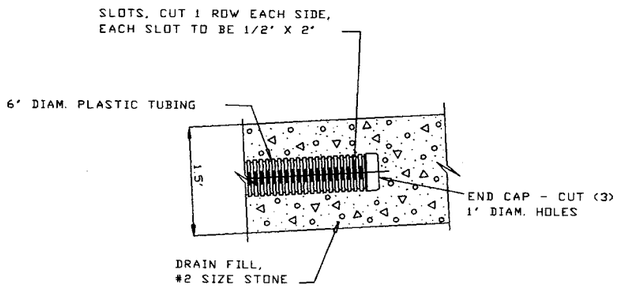
QUANTITIES

BORROW - EMERGENCY SPILLWAY	48,475	CU. YDS.
TOPSOIL SPREADING - EMERGENCY SPILLWAY	11,920	SQ. YDS

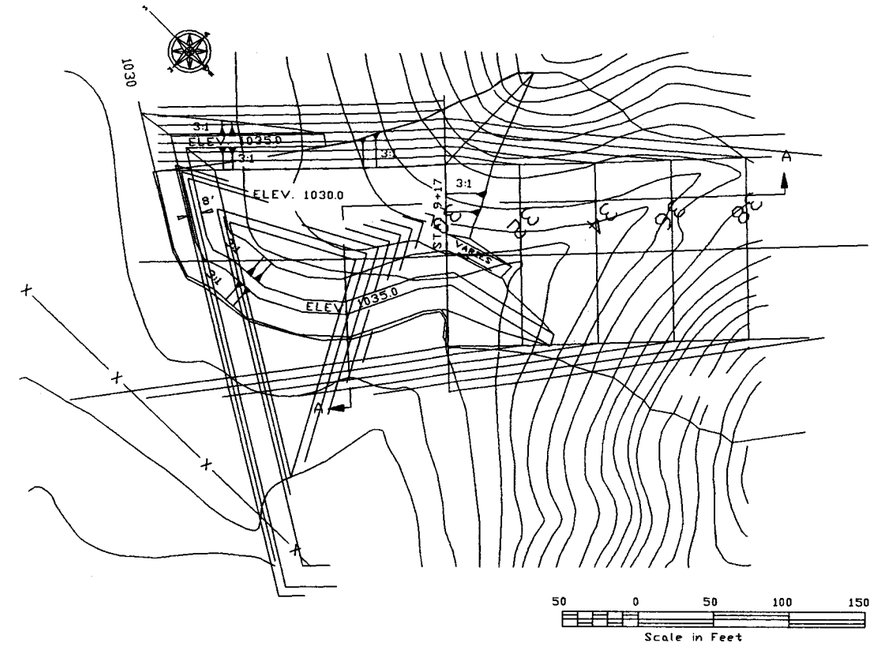
LAKE JIMMEL DAM
EMERGENCY SPILLWAY
DETAILS

SUPERB ENGINEERING, INC

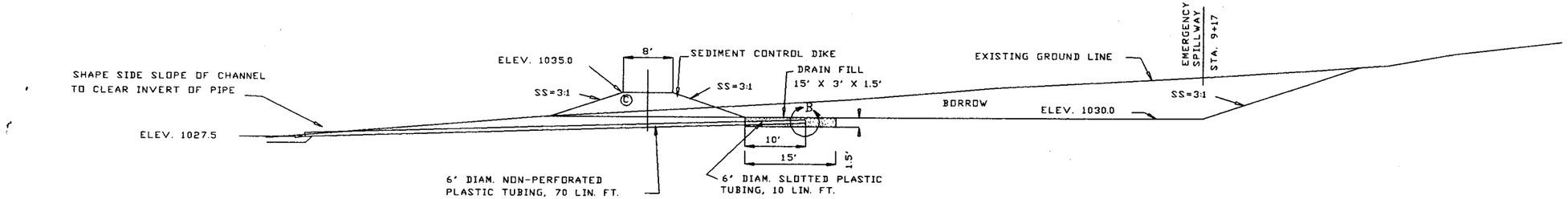
Designed		Approved By	
Drawn		Title	
Checked		Revision	
Scale		Sheet No 9 of 15	Drawing No.



DETAIL 'B'
NOT TO SCALE



SEDIMENT BASIN LOCATION



SECTION A-A
NOT TO SCALE

QUANTITIES

SEDIMENT CONTROL BASIN	SUM JOB
DRAIN FILL	3 CU. YDS.

NOTES:
1- NEAR THE COMPLETION OF THE EARTH FILL OPERATIONS, WHEN DIRECTED BY THE ENGINEER, THE SEDIMENT CONTROL DIKE SHALL BE REMOVED AND USED AS BORROW.
2- THE TUBING SHALL BE REMOVED FROM THE SITE.

LAKE JIMMEL DAM
SEDIMENT BASIN DETAILS

SUPERB ENGINEERING, INC

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Drawn		Title	
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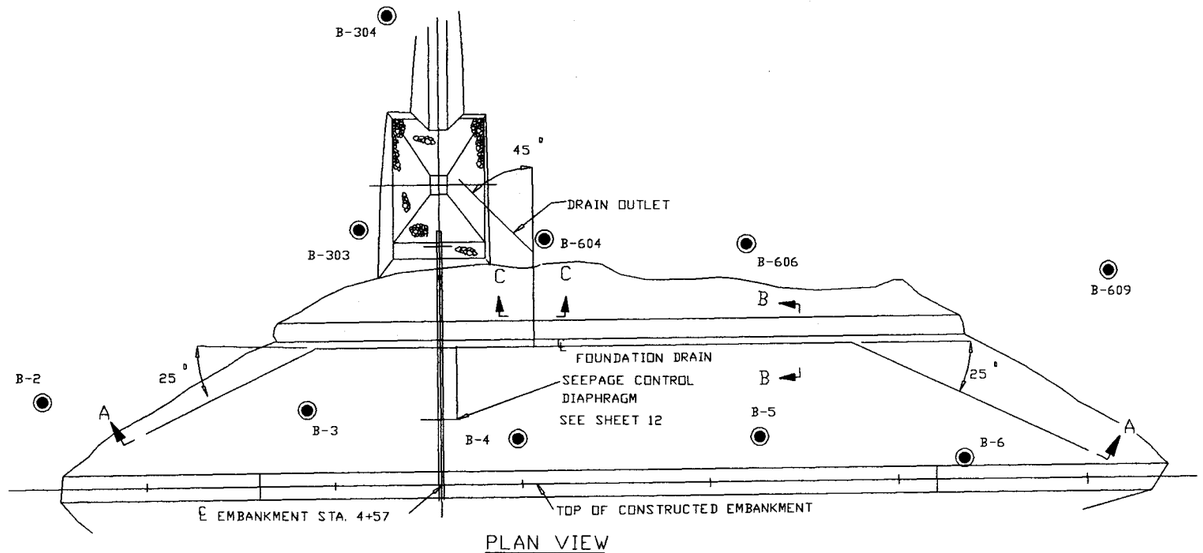
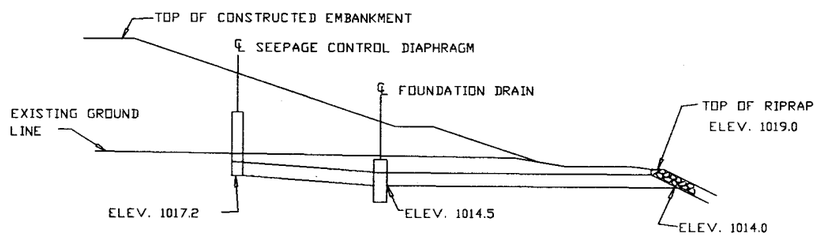
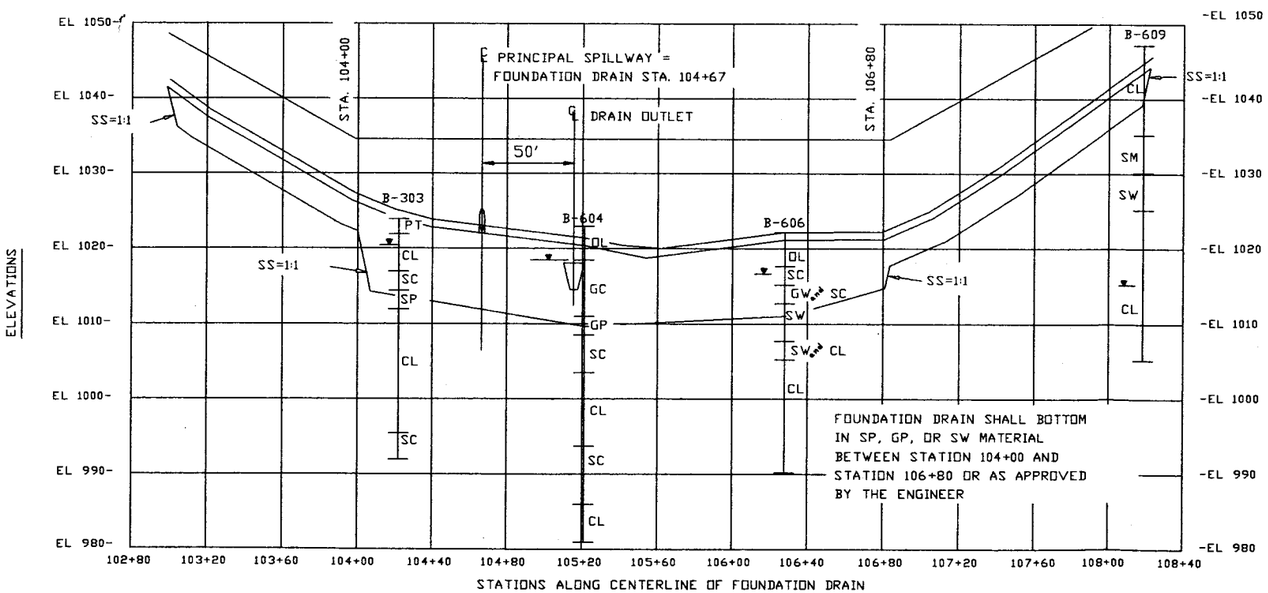
Scale	NOT TO SCALE	Sheet No. 10 of 15	Drawing No.



PLAN VIEW



DRAIN OUTLET PROFILE



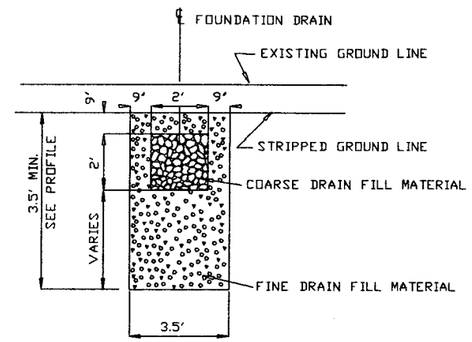
SECTION A-A

DRAIN FILL MATERIAL

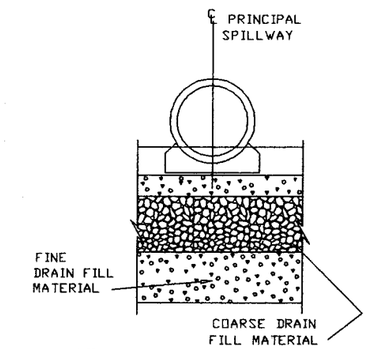
STANDARD SIEVE SIZE	COARSE % PASSING	AS-BUILT % PASSING	FINE % PASSING	AS-BUILT % PASSING
3	100			
1 1/2	85 - 100			
3/4	60 - 85			
1/2	30 - 60			
3/8	10 - 35		100	
#4	0 - 10		95 - 100	
#8	0 - 5		80 - 100	
#16	-		50 - 85	
#30	-		25 - 60	
#50	-		5 - 30	
#100	-		0 - 10	
#200	-		0 - 3	

COARSE DRAIN FILL REQUIREMENTS MAY BE MET BY USE OF INDIANA HIGHWAY COARSE AGGREGATE SIZE #5 .

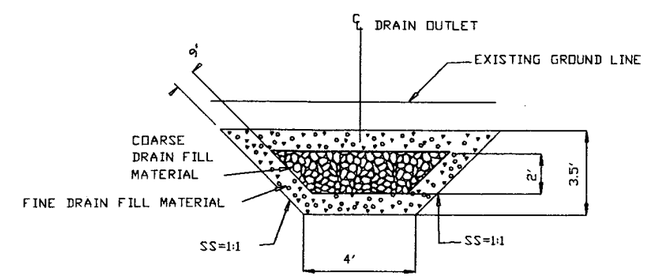
FINE DRAIN FILL REQUIREMENTS MAY BE MET BY USE OF INDIANA HIGHWAY FINE AGGREGATE SIZE #23.



SECTION B-B



DETAILS OF DRAIN FILL
AT PRINCIPAL SPILLWAY



SECTION C-C

CROSS SECTION CONFIGURATION MAY BE INVERTED AT CONTRACTOR'S OPTION.

QUANTITIES

COARSE DRAIN FILL MATERIAL	42.0	CU. YDS.
FINE DRAIN FILL MATERIAL	430.0	CU. YDS.

LAKE JIMMEL DAM DETAILS OF FOUNDATION DRAIN

SUPERB ENGINEERING, INC

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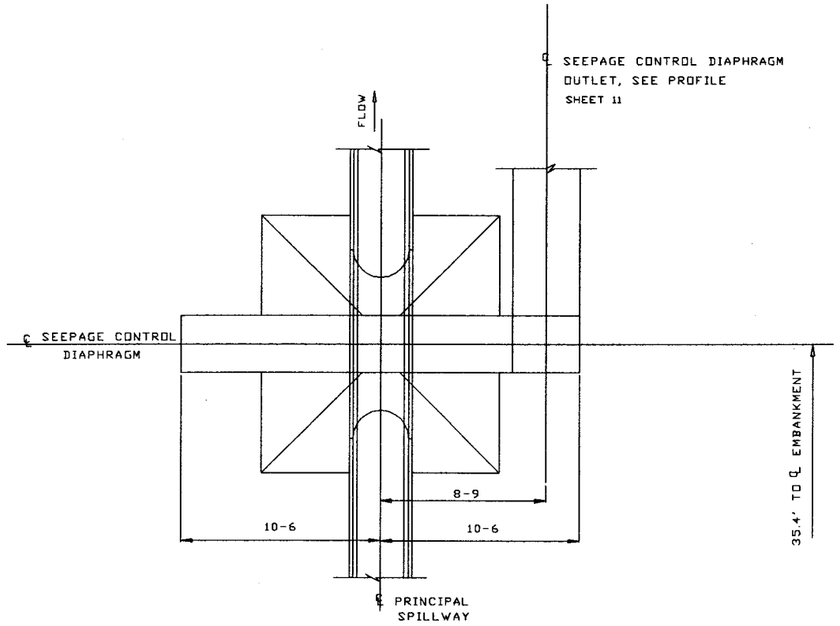
Checked		Revision	
Scale	NOT TO SCALE	Sheet No 11 of 15	Drawing No.



PLAN

SUGGESTED SEQUENCE FOR INSTALLATION OF SEEPAGE CONTROL DIAPHRAGM

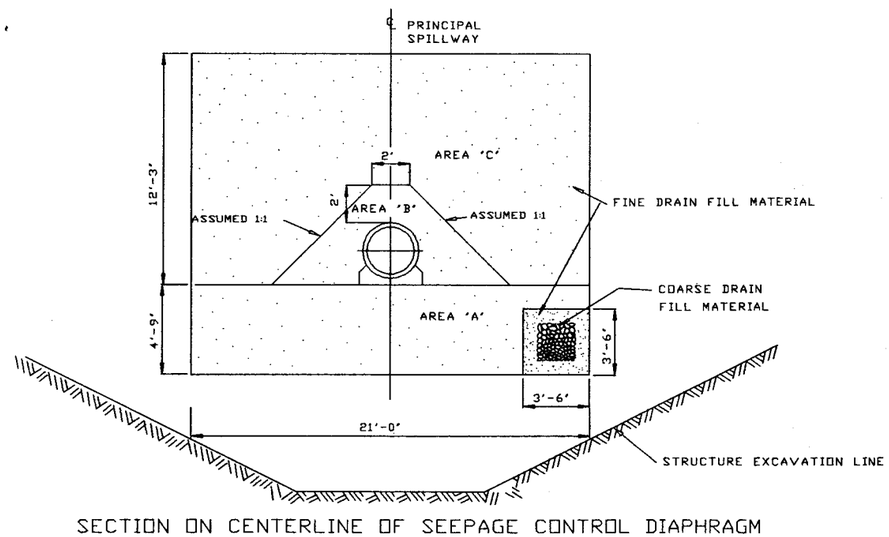
1-PLACE DRAIN FILL IN OUTLET.
2-PLACE DRAIN FILL IN AREA 'A' BELOW BEDDING SUBGRADE.
3-PLACE PIPE AND BEDDING.
4-PLACE DRAIN FILL IN AREA 'B' OVER PIPE AND BEDDING.
5-PLACE COMPACTED EARTH FILL OVER AREA 'A' AND AREA 'B'.
6-EXCAVATE TRENCH TO CONTACT CLEAN DRAIN FILL IN AREA 'A' AND AREA 'B', THEN PLACE AREA 'C'.

NOTES:
1- AREA 'A' AND 'C' MAY BE DONE IN LIFTS, THICKNESS AT CONTRACTOR'S OPTION.
2- THE DRAIN FILL SHALL BE WATER FLOODED IN ACCORDANCE WITH SPECIFICATION 24.

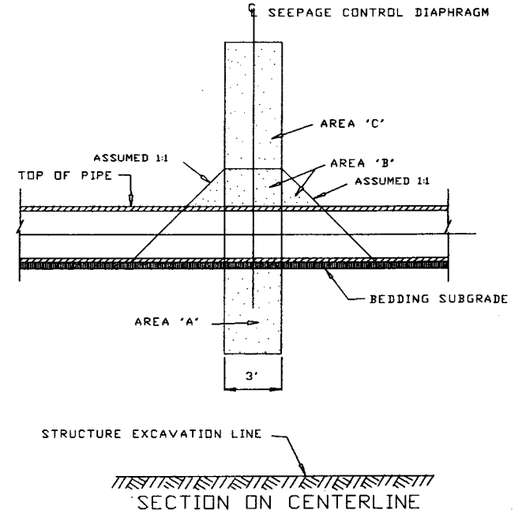
NOTE:
FOR FINE AND COARSE DRAIN FILL GRADATIONS, SEE SHEET 11.

QUANTITIES

FINE DRAIN FILL MATERIAL _____ 45.0 CU. YDS.



SECTION ON CENTERLINE OF SEEPAGE CONTROL DIAPHRAGM



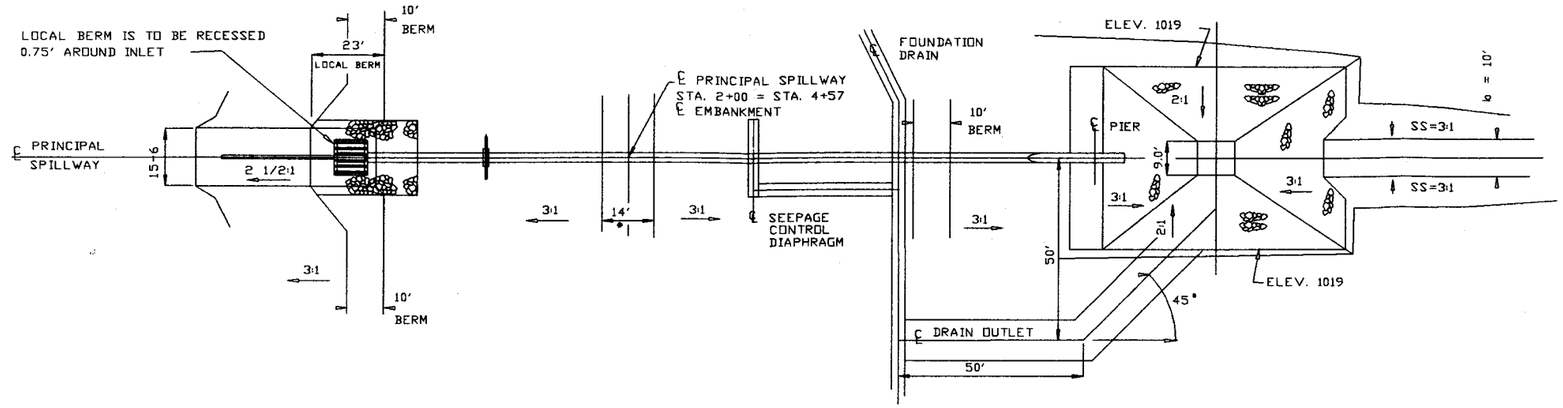
SECTION ON CENTERLINE OF PRINCIPAL SPILLWAY

0 4 8 12
SCALE IN FEET

LAKE JIMMEL DAM
SEEPAGE CONTROL
DIAPHRAGM DETAILS

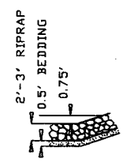
SUPERB ENGINEERING, INC

Designed		Approved By	
Drawn		Title	
Checked		Revision	
Scale		Sheet No 12 of 15	Drawing No.

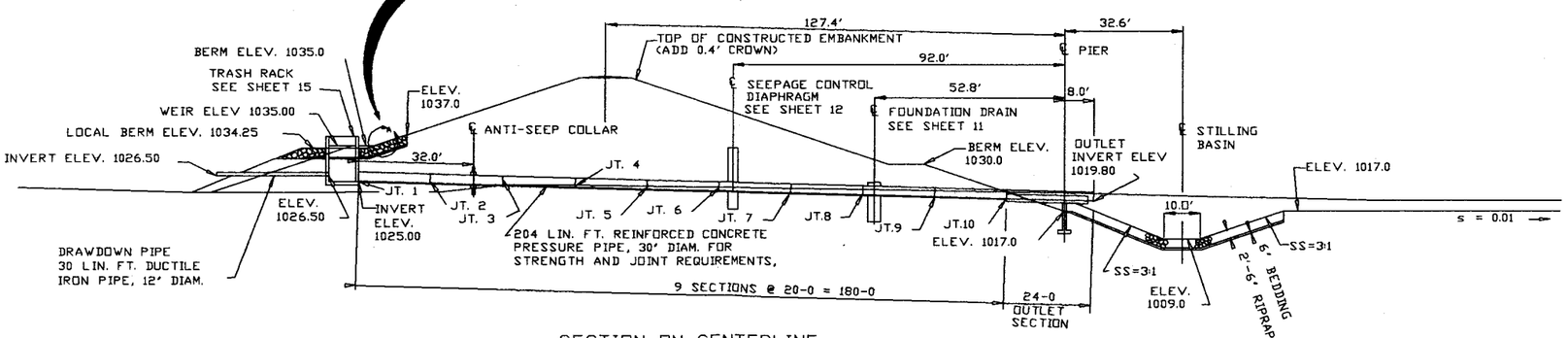


NOTES:
1- STRUCTURE IS SYMMETRICAL ABOUT THE CENTERLINE, UNLESS SHOWN.
2-CAMBER CONDUIT IN ACCORDANCE WITH ELEVATIONS SHOWN.
3- EXCEPT AS PROVIDED FOR THE PIPE OUTLET, SHORTER PIPE LENGTHS MAY BE USED IN LIEU OF THOSE SHOWN WITH A MINIMUM PIPE LENGTH OF 8 FEET, USING APPROPRIATE JOINT EXTENSIBILITY. REVISED CAMBER ELEVATIONS WILL BE FURNISHED BY THE ENGINEER IF LENGTHS OTHER THAN THOSE SHOWN ON THE DRAWINGS ARE USED.

PLAN



DETAIL A



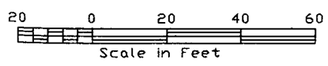
SECTION ON CENTERLINE

PIPE JOINT TABLE					
JOINT LOCATION	INVERT ELEVATION	BEFORE BACKFILL DATE		EMBANKMENT IN PLACE DATE	
		INVERT ELEVATION	JOINT GAP	INVERT ELEVATION	JOINT GAP
JT. 1	1025.00				
JT. 2	1024.89				
JT. 3	1024.65				
JT. 4	1024.27				
JT. 5	1023.76				
JT. 6	1023.20				
JT. 7	1022.58				
JT. 8	1021.91				
JT. 9	1021.19				
JT. 10	1020.41				
OUTLET	1019.80				

QUANTITIES

PIPE CONDUIT - REINFORCED CONCRETE PRESSURE PIPE, 30' DIAM. INCLUDING CONCRETE BEDDING ____ 204 LIN. FT.

DRAWDOWN PIPE - DUCTILE IRON PIPE, 12' DIAM. INCLUDING FITTINGS ____ 30 LIN. FT.



LAKE JIMMEL DAM
PRINCIPAL SPILLWAY
LAYOUT

SUPERB ENGINEERING, INC

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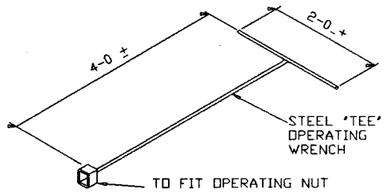
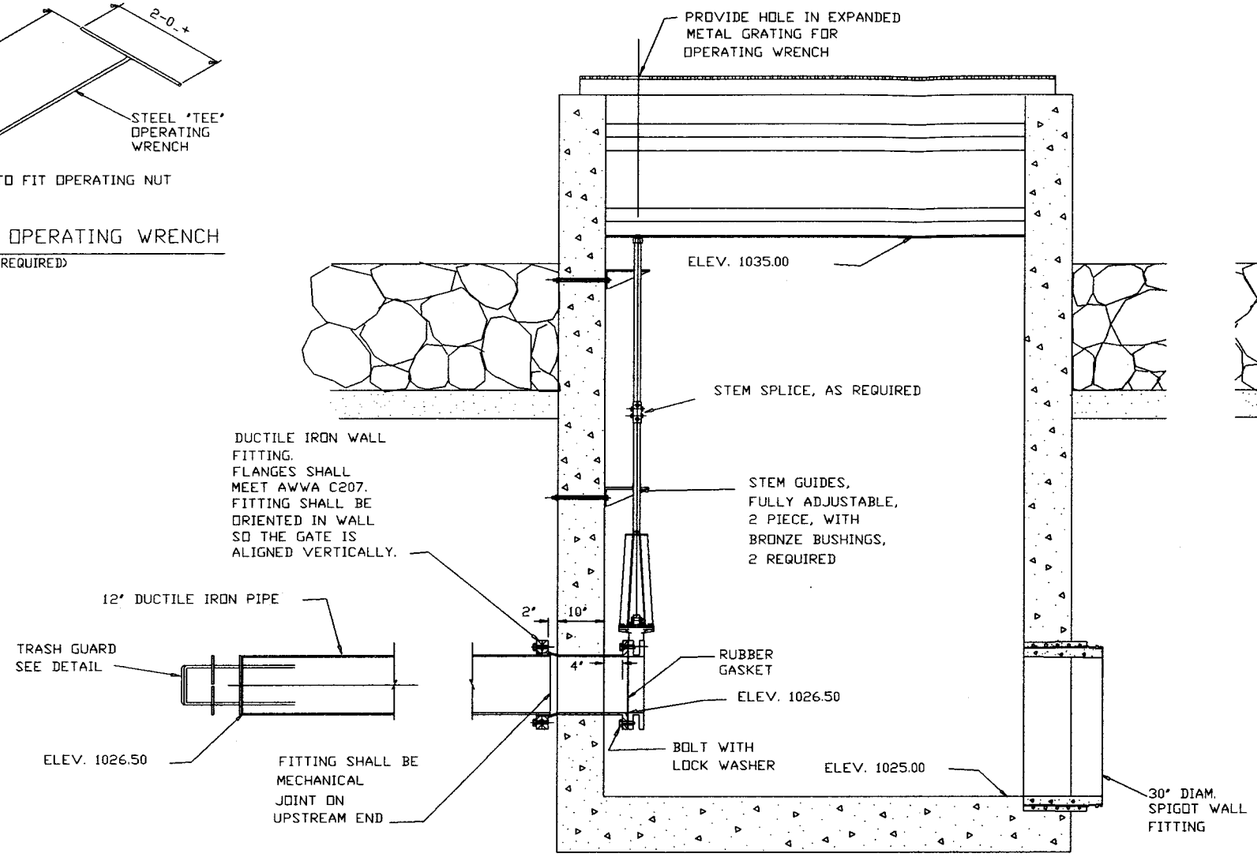
Title
Revision
Sheet No 13 of 15
Drawing No.

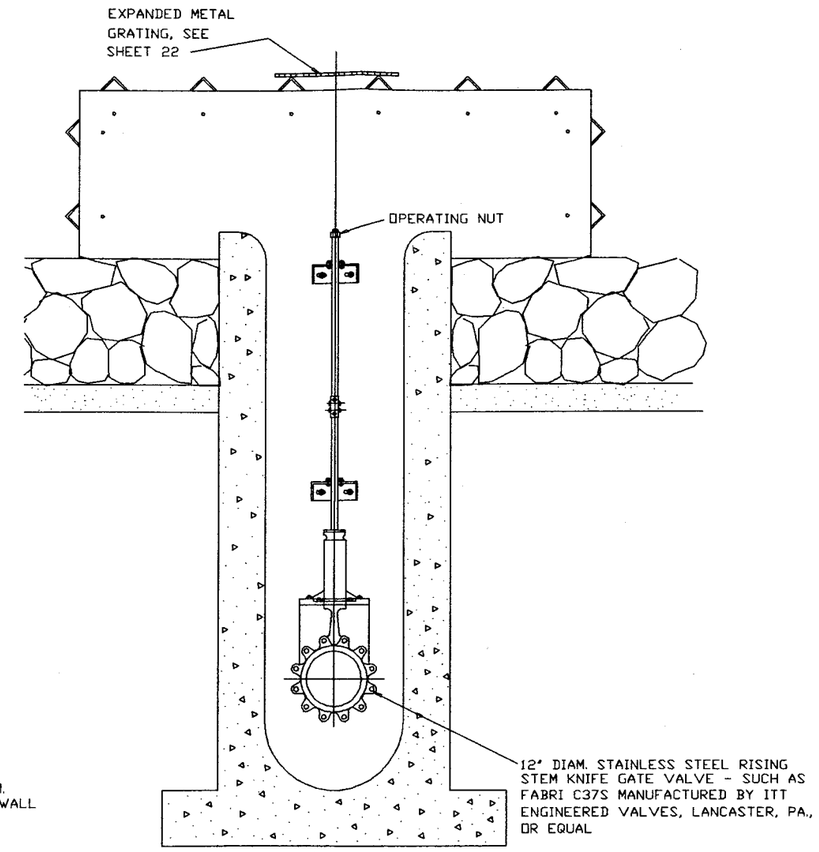


DETAIL OF OPERATING WRENCH

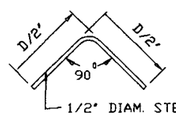
(1 REQUIRED)



SECTION ON CENTERLINE

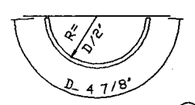


ENDWALL ELEVATION



ALTERNATE DETAIL OF MARK (A)

(4 REQUIRED)

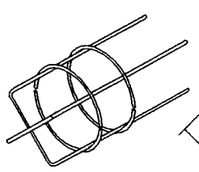


DETAIL OF MARK (A)

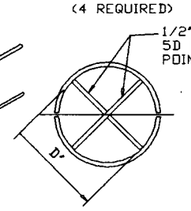
(4 REQUIRED)

QUANTITIES

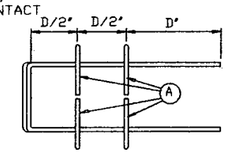
KNIFE GATE VALVE, 12" DIAM. _____ SUM JOB



ISOMETRIC



UPSTREAM ELEVATION



SIDE ELEVATION

DETAILS OF TRASH GUARD

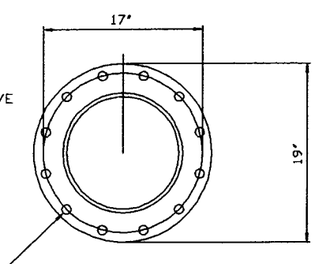
(TO BE SHOP FABRICATED AND GALVANIZED)

QUANTITIES

METAL WORK _____ PART SUM JOB

NOTE:

FLANGE ON PIPE SHALL HAVE 1" DIAM. BOLT HOLES.



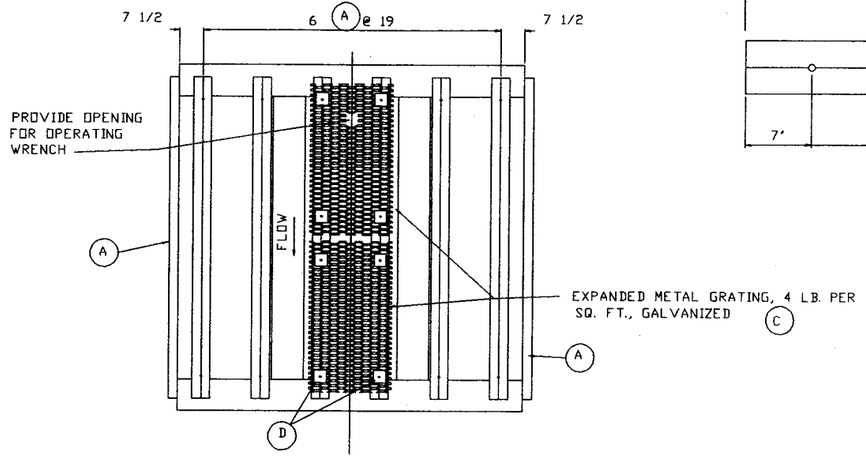
FLANGE DETAILS

(FLANGE THICKNESS = 1.25+0.12)

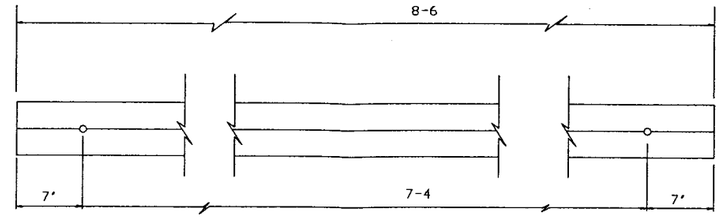
LAKE JIMMEL DAM
DETAILS OF 12" DIAMETER
DRAWDOWN KNIFE GATE

SUPERB ENGINEERING, INC

Designed	Approved By
Drawn	Title
Checked	Revision
Scale NOT TO SCALE	Sheet No 14 of 15 — Drawing No.



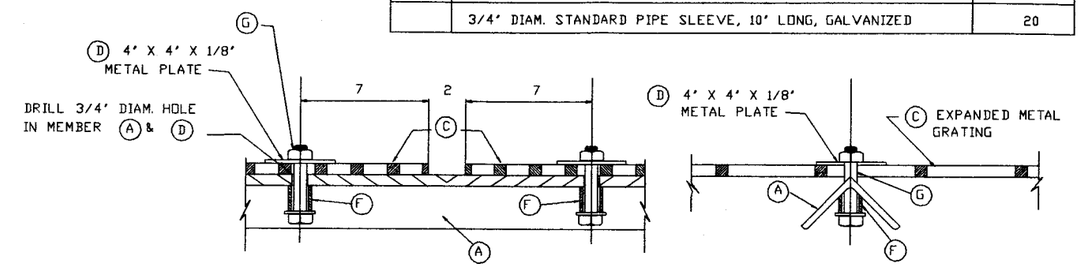
PLAN - TOP



DETAIL OF ANGLE

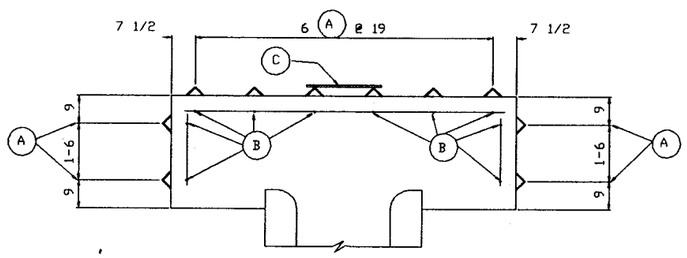
MATERIAL LIST

MARK	ITEM	QUANTITY
A	ANGLE 4"X4"X3/8", 8'-6" LONG (GALVANIZED)	10
B	5/8" GALVANIZED ROD (SEE DETAIL OF ANCHORAGE FOR ANGLE)	20
C	EXPANDED METAL GRATING, 4 LB. PER SQ. FT., GALVANIZED 2'-0" X 4'-0"	2
D	4" X 4" X 1/8" METAL PLATE, DRILLED AND GALVANIZED	8
E	FORMED SPACER, GALVANIZED	16
F	FORMED SPACER, GALVANIZED	4
G	5/8" DIAM. BOLTS, GALVANIZED, LENGTH = 4" MIN.	4
	5/8" DIAM. NUTS AND WASHERS, GALVANIZED	40
	3/4" DIAM. STANDARD PIPE SLEEVE, 10" LONG, GALVANIZED	20

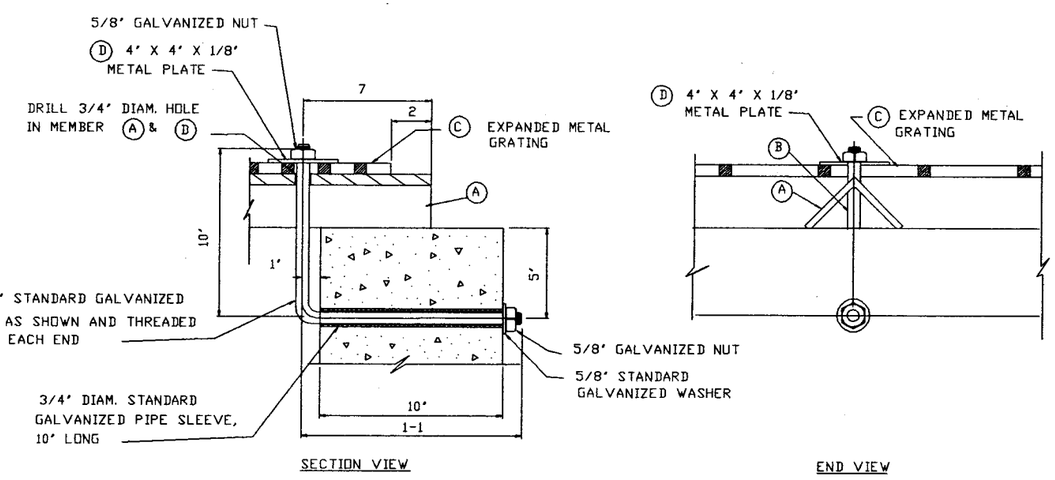


SECTION VIEW

END VIEW



ENDWALL ELEVATION

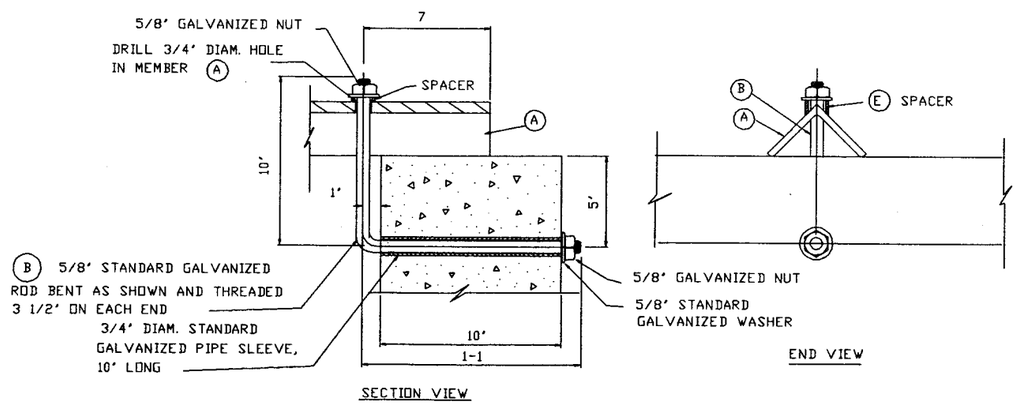


SECTION VIEW

END VIEW

DETAIL OF ANCHORAGE FOR ANGLES

(ANGLES WITH GRATING)



SECTION VIEW

END VIEW

DETAIL OF ANCHORAGE FOR ANGLES

(ANGLES WITH SPACERS)

QUANTITIES

METAL WORK _____ PART SUM JOB

LAKE JIMMEL DAM
DETAILS OF R/C INLET
TRASH RACK

SUPERB ENGINEERING, INC

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Drawn		Title	
Checked		Revision	
Scale	NOT TO SCALE	Sheet No 15 of 15	Drawing No.

PARTIAL LIST OF SPECIFICATION ITEMS FOR EXAMPLE DAM

Title

CLEARING
CLEARING AND GRUBBING
STRUCTURE REMOVAL
POLLUTION CONTROL
SEEDING AND MULCHING FOR PROTECTIVE COVER
MOBILIZATION
WATER FOR CONSTRUCTION
REMOVAL OF WATER
EXCAVATION
EARTH FILL
DRAINFILL
SALVAGING AND SPREADING TOPSOIL
PORTLAND CEMENT CONCRETE
STEEL REINFORCEMENT
REINFORCED CONCRETE PRESSURE PIPE SPILLWAY CONDUITS
DUCTILE-IRON PIPE CONDUITS
LOOSE ROCK RIPRAP
WATER CONTROL GATES
METAL FABRICATION AND INSTALLATION
FARM FIELD FENCES
GEOTEXTILE
AGGREGATE FOR PORTLAND CEMENT CONCRETE
ROCK FOR RIP RAP
PORTLAND CEMENT
AIR-ENTRAINING ADMIXTURES
WATER-REDUCING AND SET-RETARDING ADMIXTURES
CURING COMPOUND (FOR CONCRETE)
PREFORMED EXPANSION JOINT FILLER
SEALING COMPOUND FOR JOINTS IN CONCRETE AND CONCRETE PIPE
STEEL REINFORCEMENT (FOR CONCRETE)
REINFORCED CONCRETE PRESSURE PIPE
DUCTILE-IRON PIPE AND FITTINGS
METAL
GALVANIZING

Appendix F
Common Pitfalls

Common Pitfalls

The following is a listing of shortcomings that have been noted during the application and design review process. These are offered as an aid to ensure consideration has been given to all aspects of the design. Every item will not apply to each project.

- Not incorporating the geotechnical findings and recommendations into the plans and specifications.
- Not allowing the geotechnical contractor to review the final plans & specifications before submission
- Not providing a low level outlet for emptying the reservoir.
- Not providing a low level outlet large enough to drain the reservoir in a timely fashion.
- Not encasing or cradling the outlet pipe in concrete through the dam embankment (i.e. not eliminating the seepage path along the pipe).
- Pressurizing the outlet pipe by regulating the flow at the downstream end.
- Insufficient energy dissipation in the spillway
- Inadequate joints details for the concrete spillway slabs.
- Incompatible materials in the filter drains.
- Inadequate provision for differential settlement.
- Insufficient drainage and filters to control seepage through the dam and foundation.
- Inadequate shaping and preparation of the foundation for placement of fill materials.
- Not sloping the crest towards the upstream slope.
- Earthen spillways activating prior to the 50-year storm.
- Improper usage of filter fabric.
- Use of filter fabric for separation of coarse and fine aggregate.
- No animal guards on the toe drains.
- Not providing protection for any exposed PVC from UV radiation and vandalism.
- Improper conduit selection.
- Allowing blasting to take place in the vicinity of the dam without appropriate precautions.
- Not grouting abandoned boreholes used to evaluate existing dam that is currently impounding water.
- Not addressing instrumentation needs for monitoring during filling and normal operation, and other monitoring such as settlement during the construction process.
- Not providing adequate drop and/or projection of drain outlet pipes to allow for collection of seepage flows during monitoring and normal operation.
- Not addressing the need to ensure bonding between lifts of fill.
- Lack of adequate earthwork moisture control.
- Not providing berms on the downstream slope at appropriate intervals.
- No erosion protection at the abutment contacts (groins).
- Not providing for clearing 50 feet beyond the downstream toe of the dam.
- Not providing cleanouts on the interval drainage system.
- Not addressing seepage along the spillway conduits.
- Inadequate freeboard.
- Not addressing seismic stability issues including the riser structure.
- Not addressing the impact of utilities in the vicinity of dam.

- Using inadequate vegetation on the dam.
- Inadequate or no trash rack.
- Inadequate consideration of the impact of excavation within reservoir pool with respect to seepage control.
- Not evaluating the proposed dam over abandon coal mine areas.
- Not providing adequate erosion control prior to the establishment of a gravel ground cover.
- Not submitting as-built plans to the Division of Water.
- Allowing discharge from the emergency spillway to erode the toe of the downstream slope.
- Lack of consistency between plan sheets and supporting technical data (i.e. elevation and slope discrepancies).

Appendix G
Special Construction Monitoring Reports

A. Special Construction Monitoring Reports

1. Pressure Testing of Conduits

All conduits through the embankment should be pressure tested in accordance with the applicable ASTM and/or ANSI/AWWA Specification. A continuous record should be kept of all such tests and the information submitted for review should contain the following data:

Equipment - Equipment to perform the test.

Pressure and Duration - Specified testing pressure and minimum test periods.

Acceptance Criteria - Acceptable leakage criteria for test.

Records - A copy of the continuous record of the test and any re-tests.

2. Laboratory Material Certification

All drain and filter materials obtained from an off-site source should be regularly checked for compliance with the project specifications. Documentation should be provided that the materials supplied for placement in the dam meet the required gradation limits. Such documentation should include a certified copy of the suppliers' gradation tests. Synthetic filter material should be clearly marked for identification and include the manufacturer's certification number actually shipped to the job site.

3. Grouting

Evidence should be submitted that an acceptable grout curtain was constructed within the foundation of the proposed dam structure. To satisfy these requirements the report should contain the following information:

Drilling Equipment - Equipment that was used to drill the exploratory and grout holes.

Grout Equipment - Equipment that was used to mix the ingredients of the grout and pump the slurry down the holes.

Laboratory Equipment - Laboratory equipment that was used for on-site control tests.

Grout Mix Criteria - Specified performance values/properties of grout mix (es).

Trial Mixes - The results of any tests and trials that were made on a variety of grout mixes prior to the main grouting operation.

Design Mixes - The grout design mix(es).

Water Testing - The results of all water pressure tests in exploratory or grout holes.

Field Test Results - The results of all field tests conducted on each of the grout mixes during the grouting program with identification of non-compliant results and remedial action. Field tests should include, but not be limited to, sedimentation, slurry density, Marsh Funnel viscosity and unconfined compressive strength.

Profile - A longitudinal profile of the grout curtain showing drilling depths and grout takes for each stage of the grout holes.

4. Slurry Wall

Evidence should be submitted that a relatively impervious slurry trench cutoff was successfully installed within the foundation of the proposed dam. To satisfy these requirements, the report should contain the following information.

Excavation Equipment - Equipment that was used for construction of the working platform and for trenching.

Slurry Equipment - Equipment that was used for mixing the slurry.

Backfill Equipment - Equipment that was used for mixing and placing the backfill.

Test Equipment - Equipment that was used for the control tests.

Backfill Mix Design - Slurry backfill mix design.

Acceptance Criteria - Specified performance values/properties of slurry and backfill mix.

Field Test Results - Results of control tests, with identification of non-compliance results and remedial actions. Control tests on the slurry should include, but not be limited to, pH, unit weight, filtrate loss and viscosity. Control tests on the backfill shall include, but not be limited to, permeability, Atterburg Limits, slump, percentage passing the No. 200 sieve, water content, bentonite content and unit weight.

Profile - A longitudinal profile of the slurry wall showing excavation depths, materials excavated and backfill placed.

5. Blast Monitoring

It is assumed that all blasting operations should be conducted in strict accordance with existing ordinances and regulations. To ensure that no appreciable vibration was transmitted to existing structures or facilities a monitoring report should be prepared for each blasting event. This report should include, as a minimum, the following information:

Preblast Inspections - Documentation of any preblast observations.

Monitoring Equipment - List of equipment used to monitor the blast.

Time and Location - Date, time and location of blast.

Monitoring Locations - List of structures/facilities monitored.

Acceptance Criteria - Allowable vibration parameters.

Monitoring Records - Seismograph records and interpretation.

Post Blast Inspections - Documentation of any post blast observations.

Appendix H
Correction Form

Guidelines for Dams
Amendment Form

Name: _____

Address: _____

Phone and fax numbers: _____

The following sections, discussions, etc...should be included in these guidelines (provide as much detail as possible). _____
_____
_____
_____

In reading the guidelines, I have noted the following errors (please indicate section as well as page number). _____
_____
_____
_____
_____

This form can be produced as needed. Please mail your completed form to:

Division of Water
402 W. Washington Street
Room W264
Indianapolis, IN 46204
Attn: Dam and Levee Safety Section
Phone 1-877-928-3755

You can also fax the complete form to us at (317) 233-4579.

Information Maintained by the Office of Code Revision Indiana Legislative Services Agency

IC 14-27-7

Chapter 7. Dams, Dikes, and Levees; Regulation

IC 14-27-7-1

"Owner" defined

Sec. 1. As used in this chapter, "owner" means an individual, a firm, a partnership, a copartnership, a lessee, an association, a corporation, an executor, an administrator, a trustee, the state, an agency of the state, a municipal corporation, a political subdivision of the state, a legal entity, a drainage district, a levee district, a conservancy district, any other district established by law, or any other person who has a right, a title, or an interest in or to the property upon which the levee, dike, or floodwall and appurtenant works is located.

As added by P.L.1-1995, SEC.20. Amended by P.L.148-2002, SEC.6.

IC 14-27-7-2

Maintenance and repair

Sec. 2. The owner of a levee, dike, or floodwall and appurtenant works shall maintain and keep the structures and appurtenant works in the state of repair and operating condition required by the following:

(1) The exercise of prudence.

(2) Due regard for life or property.

(3) The application of sound and accepted engineering principles.

As added by P.L.1-1995, SEC.20. Amended by P.L.148-2002, SEC.7.

IC 14-27-7-3

Powers and duties of department

Sec. 3. The department:

(1) has, on behalf of the state, jurisdiction and supervision over the maintenance and repair of levees, dikes, floodwalls, and appurtenant works in, on, or along the rivers and streams of Indiana;

(2) shall exercise care to see that the dikes, floodwalls, levees, and appurtenances are maintained in a good and sufficient state of repair and operating condition to fully perform the intended purpose;

(3) may adopt rules under IC 4-22-2 for maintenance and operation that are necessary for the purposes of this chapter; and

(4) may vary the standards for maintenance and operation, giving due consideration to the following:

(A) The type and location of the dike, floodwall, levee, or appurtenance.

(B) The hazards to which the dike, floodwall, levee, or appurtenance is or may be exposed.

(C) The peril to life or property if the dike, floodwall, levee, or appurtenance fails to perform the structure's function.

As added by P.L.1-1995, SEC.20. Amended by P.L.148-2002, SEC.8.

IC 14-27-7-4

Engineering inspections

Sec. 4. (a) The department shall make an engineering inspection of all levees, dikes, and floodwalls and appurtenant works:

(1) at least one (1) time every three (3) years or at more frequent intervals if the exigencies of the

case require; or
(2) upon the written request of an affected person or agency.
(b) The department shall place in the files of the department a report of each inspection conducted under subsection (a).
(c) This chapter does not apply to the following:
(1) A levee, dike, or floodwall that meets both of the following conditions:
(A) Is under a single private ownership.
(B) Provides protection only to land or other property under the single private ownership.
(2) A dike, floodwall, or levee that is regulated under the federal Mine Safety and Health Act of 1977, unless the dike, floodwall, or levee is proposed to be retained as a permanent structure after bond release.
As added by P.L.1-1995, SEC.20. Amended by P.L.75-1998, SEC.4; P.L.148-2002, SEC.9.

IC 14-27-7-5
Notice of violation
Sec. 5. If the department finds that a dike, floodwall, levee, or appurtenance is:
(1) not sufficiently strong;
(2) not maintained in a good and sufficient state of repair or operating condition; or
(3) unsafe and dangerous to life or property;
the department shall issue a notice of violation to the owner of the dike, floodwall, levee, or appurtenance under IC 14-25.5-2.
As added by P.L.1-1995, SEC.20. Amended by P.L.148-2002, SEC.10; P.L.71-2004, SEC.11.

IC 14-27-7-6
Emergency measures to protect life and property
Sec. 6. (a) If at any time the condition of a levee, a dike, a floodwall, or an appurtenance becomes so dangerous to the safety of life and property that, in the opinion of the department there is not sufficient time for the issuance and enforcement of a notice of violation for the maintenance, alteration, repair, reconstruction, change in construction or location, or removal of the dike, floodwall, levee, or appurtenance in the manner provided in this chapter, the department may immediately take the measures that are essential to provide emergency protection to life and property.
(b) The department may recover the cost of the emergency measures from the owner by appropriate legal action.

As added by P.L.1-1995, SEC.20. Amended by P.L.148-2002, SEC.11.

IC 14-27-7-7
Violations
Sec. 7. An owner who knowingly fails to effect the maintenance, alteration, repair, reconstruction, change in construction or location, or removal within the time limit set forth in the notice of violation of the department under:
(1) section 5 of this chapter; or
(2) IC 13-2-20-4 (before its repeal);
commits a Class B infraction. Every day of failure constitutes a separate infraction.
As added by P.L.1-1995, SEC.20. Amended by P.L.148-2002, SEC.12; P.L.71-2004, SEC.12.

IC 14-27-7-8
Right of entry upon premises
Sec. 8. The department and the department's agents, engineers, and other employees may, for the purposes of determining the department's jurisdiction and performing the engineering inspections provided in section 4 of this chapter, enter upon any land or water in Indiana without liability for

trespass. The owner of a levee, dike, or floodwall and appurtenant works shall do the following:

(1) Cooperate with the department and the department's agents, engineers, and other employees in the conduct of the inspections.

(2) Facilitate access to the dike, floodwall, levee, or appurtenance.

(3) Furnish upon request the plans, specifications, operating and maintenance data, or other information that is pertinent to the dike, floodwall, levee, or appurtenance.

As added by P.L.1-1995, SEC.20. Amended by P.L.148-2002, SEC.13.

IC 14-27-7-9

Exemption of department from liability

Sec. 9. This chapter does not create a liability for damages against the department or the department's officers, agents, and employees caused by or arising out of any of the following:

(1) The construction, maintenance, operation, or failure of a levee, dike, or floodwall and appurtenant works.

(2) The issuance and enforcement of a notice of violation or a rule issued by the department to carry out the department's duties.

As added by P.L.1-1995, SEC.20. Amended by P.L.148-2002, SEC.14.

567—72.3(455B) Dams. The following criteria shall apply to dams which exceed the thresholds in 567—71.3(455B).

72.3(1) *General criteria for all regulated dams.*

a. Required findings. The department will approve the construction, operation or maintenance of a dam or modification of a dam or appurtenant structure only after finding that the project is designed in accordance with accepted engineering practice and methods and in a manner consistent with the applicable criteria and guidelines in department Bulletin No. 16, "Design Criteria and Guidelines for Iowa Dams," December 1990.

b. Anticipation of changed circumstances. In applying the approval criteria in subrule 72.3(1), paragraph *"a,"* consideration shall be given to both existing conditions and potential future conditions which can reasonably be anticipated at the time the application is reviewed.

c. Landowner notification. The department staff engineering review of the plans and specifications for a dam project shall determine whether there are lands upstream, downstream, or adjacent to the impoundment whose use apparently would be potentially adversely affected by maintenance of the dam and appurtenant structures, spillway discharges, temporary ponding of floodwater behind the dam, or failure of the dam. It is the applicant's responsibility to submit sufficient information with the application and on request to enable the staff to accurately identify the owners and occupants of affected lands. The staff shall notify all known affected owners and occupants that the project may affect use of land in which they have an interest and advise them of their opportunity to be heard on the application. The project shall not be approved unless it appears that notice reasonably calculated to advise all owners and occupants has been given and that they have had an opportunity to be heard.

72.3(2) *Dams other than low head dams.* The following criteria shall apply to all dams other than low head dams:

a. Assignment of hazard class. Dams shall be assigned a hazard class based on the potential consequences of failure. Anticipated future land and impoundment use shall be considered in the determination of hazard class. The criteria in this subrule shall be used to determine hazard class regardless of the methodology used in engineering design of a dam. The hazard class shall determine the design requirements of the structure as outlined in department Bulletin No. 16. The hazard class shall be evaluated using the following criteria:

(1) *Low hazard.* A structure shall be classified as low hazard if located in an area where damages from a failure would be limited to loss of the dam, loss of livestock, damages to farm outbuildings, agricultural lands, and lesser used roads, and where loss of human life is considered unlikely.

(2) *Moderate hazard.* A structure shall be classified as moderate hazard if located in an area where failure may damage isolated homes or cabins, industrial or commercial buildings, moderately traveled roads or railroads, interrupt major utility services, but without substantial risk of loss of human life. In addition, structures where the dam and its impoundment are of themselves of public importance, such as dams associated with public water supply systems, industrial water supply or public recreation, or which are an integral feature of a private development complex, shall be considered moderate hazard for design and regulatory purposes unless a higher hazard class is warranted by downstream conditions.

(3) *High hazard.* A structure shall be classified as high hazard if located in an area where failure may create a serious threat of loss of human life or result in serious damage to residential, industrial or commercial areas, important public utilities, public buildings, or major transportation facilities.

(4) *Multiple dams.* Where failure of a dam could contribute to failure of a downstream dam or dams, the minimum hazard class of the dam shall not be less than that of any such downstream structure.

b. Lands, easements, and rights-of-way. An application for approval of a dam project shall include information showing the nature and extent of lands, easements, and rights-of-way which the applicant has acquired or proposes to acquire to satisfy the following criteria:

(1) Ownership or perpetual easements shall be obtained for the area to be occupied by the dam embankment, spillways, and appurtenant structures, and the permanent or maximum normal pool;

(2) Ownership or easements shall be obtained for temporary flooding of areas which would be inundated by the flood pool up to the top of dam elevation and for spillway discharge areas;

(3) Easements covering areas affected by temporary flooding or spillway discharges shall include provisions prohibiting the erection and usage of structures for human habitation or commercial purposes without prior approval by the agency;

(4) In locating the site of a dam and in obtaining easements and rights-of-way, the applicant shall consider the impacts which anticipated changes in land use downstream of a dam or adjacent to the impoundment could have on the hazard class of the dam, the operation of the dam, and the potential liability of the dam owner;

(5) The applicant may be required to acquire control over lands downstream from the dam as necessary to prevent downstream development which would affect the hazard class of the dam.

c. Other approvals required. The applicant shall comply with all applicable provisions of 567—Chapters 51, 52 and 73 concerning water storage permits, operating permits, and inspections.

d. Additional requirements for major dam structures. Dams which are major dam structures as defined in 567—Chapter 70 must satisfy additional criteria set forth in Chapter VI of department Bulletin No. 16.

72.3(3) *Low head dams.* The following criteria shall apply to low head dams:

a. The location and design of a low head dam shall not adversely affect the fisheries or recreational use of the stream.

b. The pool created by a low head dam shall not adversely affect drainage on lands not owned or under easements by the applicant.

c. The structure shall be hydraulically designed to submerge before bankfull stage is reached in the stream channel in order that increased or premature overbank flooding does not occur. Where this cannot be reasonably accomplished in order for the structure to fulfill its intended purpose, the applicant shall demonstrate that any increased flooding will affect only lands owned or controlled by the applicant.

d. For projects which include significant appurtenant structures or works outside the stream channel, the combined effect of the total project shall not create more than 1 foot of backwater during floods which exceed the flow capacity of the channel, unless the proper lands, easements, or rights-of-way are obtained.

e. The structure shall be capable of withstanding the effects of normal and flood flows across its crest and against the abutments, and adjacent channel or bank areas shall be protected against erosion as needed.

72.3(4) *Operating plan.* For any dam with movable structures which must operate or be operated during times of flood or to provide minimum downstream flow, or where the impoundment level is raised or lowered on a regular basis, an operating plan must be submitted for approval. The plan shall be in accordance with department Bulletin No. 16 and rules in 567—Chapter 73.

72.3(5) *Encroachment on a confinement feeding operation structure.* A dam shall not be constructed or modified so that the ordinary high water of the lake, pond or reservoir created by the dam is closer than the following distances from a confinement feeding operation structure unless a secondary containment barrier according to 567—subrule 65.15(17) is in place. Measurement shall be from the closest point of the confinement feeding operation structure to the water edge of the lake, pond or reservoir for a pool level at the elevation of the crest of the emergency spillway or at the top of dam elevation should the dam not have an emergency spillway.

a. Minimum separation between a water source other than a major water source and a confinement feeding operation structure is 500 feet.

b. Minimum separation between a major water source and a confinement feeding operation structure is 1,000 feet or such distance that the structure is not located on land that would be inundated by Q100, whichever is greater.

This rule is intended to implement Iowa Code sections 455B.262, 455B.264, 455B.270, 455B.275 and 455B.277.

E.14. Iowa

IOWA DEPARTMENT OF NATURAL RESOURCES

Technical Bulletin No. 16

DESIGN CRITERIA AND GUIDELINES FOR IOWA DAMS

December, 1990

IOWA DEPARTMENT OF NATURAL RESOURCES

TECHNICAL BULLETIN NUMBER 16

FLOODPLAIN MANAGEMENT PROGRAM
DESIGN CRITERIA AND GUIDELINES FOR IOWA DAMS*

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* Adopted by reference 567—72.3(1)”a”, Iowa Administrative Code

CHAPTER I
INTRODUCTION

The purpose of this bulletin is to set forth technical design criteria and guidelines that the Department of Natural Resources will use in reviewing applications to obtain a permit for construction, operation and maintenance or modification of a dam. Other requirements which must be met in order to secure such a permit are outlined in the Iowa Administrative Code under agency number 567. Several chapters of the department's administrative rules in 567 Iowa Administrative Code concern the construction, operation and maintenance of dams as follows:

> Chapter 70 contains definitions of terms used in other chapters.
>
> Chapters 50, 51 and 52 concern water permits which must be obtained to authorize storage of water in surface impoundments.
>
> Chapter 71 explains when approval is required in order to construct, modify, operate and maintain dams.
>
> Chapter 72 lists criteria for approval of dam projects.
>
> Chapter 73 concerns operational procedures for dams, fluctuation of water levels in impoundments, abandonment and removal of dams, inspections of dam sites and dams, and designation of unsafe dams. Chapter 73 applies to all dams whose dimensions or effects exceed the regulatory thresholds in Chapter 71.

Copies of the department's administrative rules may be obtained from the Records Center, Department of Natural Resources, Wallace State Office Building, Des Moines, Iowa 50319, upon request.

The above-described rules should be consulted when planning to construct or modify a dam, change the operation or use of a dam, or abandon or remove a dam. This bulletin is part of the above-described rules and is intended for use in conjunction with them. The chapters entitled "Hazard Classifications" and "Lands, Easements, Rights-of-Way" are substantively identical to rules published in the Iowa Administrative Code. These non-technical criteria are repeated in this bulletin for the convenience of the user.

Minimum requirements in this bulletin are labeled as "guidelines" or "criteria" depending on the frequency with which they are likely to be relevant to the safety of a particular type of structure. The distinction between criteria and guidelines is not intended to be rigid. When the applicability of a criterion or guideline to a particular project is not clear to the design engineer, the engineer should consult the department. Any permit issued by the department must explain the reasons for waiving conformity with a criterion or guideline determined to be applicable to the type of structure proposed.

Adoption and Amendment of Bulletin #16. This bulletin has been adopted as part of the department's administrative rules. Pursuant to Section 17A.6(3), Code of Iowa, this bulletin is not published in the Iowa Administrative Code but copies will be made available to the public upon request at no more than the cost of reproduction.

This bulletin may be amended from time to time by rulemaking proceedings. Amended editions of this bulletin will be identified in Chapter 72 of the department's rules by reference to the year and month that the new, superseding edition becomes effective. The user should obtain a copy of current departmental rules as published in the Iowa Administrative Code and compare the edition date on the cover page of this bulletin with the edition date identified in the rules.

CHAPTER II
HAZARD CLASSIFICATION[1]

Dams shall be assigned a hazard class based on the potential consequences of failure. Anticipated future land and impoundment use shall be considered in the determination of hazard class. The criteria in this chapter shall be used to determine hazard class regardless of the methodology used in engineering design of a dam. The hazard class shall determine the design requirements of the structure as outlined in this bulletin. The hazard class shall be evaluated using the following criteria.

A) Low Hazard. Structures located in areas where damages from a failure would be limited to loss of the dam, loss of livestock, damages to farm out-buildings, agricultural lands, and lesser used roads, and where loss of human life is considered unlikely.

B) Moderate Hazard. Structures located in areas where failure may damage isolated homes or cabins, industrial or commercial buildings, moderately traveled roads or railroads, interrupt

[1] This chapter is substantively identical to 567—72.3(2)"a", Iowa Administrative Code.

major utility services, but without substantial risk of loss of human life.

In addition, structures where the dam and its impoundment are of themselves of public importance, such as dams associated with public water supply systems, industrial water supply or public recreation, or which are an integral feature of a private development complex, shall be considered moderate hazard for design and regulatory purposes unless a higher hazard class is warranted by downstream conditions.

C) High Hazard. Structures located in areas where failure may create a serious threat of loss of human life or result in serious damage to residential, industrial or commercial areas, important public utilities, public buildings, or major transportation facilities.

D) Multiple Dams. Where failure of a dam could contribute to failure of a downstream dam or dams, the minimum hazard class of the dam shall not be less than that of any such downstream structure.

CHAPTER III
DESIGN FLOODS

A dam will be required to safely accommodate or pass certain minimum flood events. Routings of the flood hydrograph through the impoundment should begin at an elevation no lower than the normal operating level. The magnitude or frequency of the required flood discharges will vary with the hazard classification, size, and drainage area of the project.

A) Freeboard Design Flood

The specified freeboard design flood represents the greatest flood the dam must be designed to accommodate. The flood must be passed without overtopping of the dam and endangering its safety or the dam must be designed to withstand such overflow. Some erosion damage in earth emergency spillways will be tolerated, provided the safety of the dam would not be compromised.

For dams with emergency spillways, the top of dam elevation after settlement shall not be less than the highest peak pool elevation reached during the freeboard design flood. For dams without an emergency spillway, the top of dam elevation shall be two feet higher than the peak flood elevation expected to occur during passage of the freeboard design flood, unless it is specifically designed to withstand the overflow.

In the following circumstances, the indicated freeboard design flood will be used:

1) All high hazard dams: the probable maximum flood (PMF).

2) All moderate hazard dams, and low hazard dams classified as major structures: one-half (0.5) of the probable maximum flood (a flood hydrograph produced by multiplying the ordinates of the PMF hydrograph by a factor of 0.5).

3) Low hazard dams not classified as major structures:

a. Where the height of the emergency spillway crest* measured above the elevation of the channel bottom at the centerline of the dam (in feet) multiplied by the total storage volume (in acre-feet) to the emergency spillway crest elevation* is between 3,000 and 30,000, the flood shall correspond to the rainfall calculated from the following formula developed by the USDA Soil Conservation Service.

Rainfall = P100 + 0.12 (PMP – P100)

b. Where the height of the emergency spillway crest* measured above

the elevation of the channel bottom at the centerline of the dam (in feet) multiplied by the total storage volume (in acre-feet) to the emergency spillway crest elevation* is less than 3,000, the flood shall be that resulting from the 50-year, 24-hour precipitation.

B) Principal Spillway Design Floods and Discharge Capacity

The principal spillway is normally a concrete or metal conduit or structure which conveys water through or around the dam. Its size and discharge capacity are governed primarily by the following factors: the need to control flood discharges downstream from the dam, and the need to limit both the depth to which floodwaters are impounded and the length of time for which they are impounded. Related to these factors is the need to limit the frequency of operation of emergency spillways.

Except where special considerations must be addressed, the criteria listed below shall apply to the design of principal spillways. The design floods indicated must be passed by the principal spillway without need for operation of an emergency spillway.

1) Design Floods
   a. High hazard dams – the 100-year flood.
   b. Moderate hazard dams – the 50-year flood.
   c. Low hazard dams with drainage areas of 250 acres or more – the 25-year flood.
   d. Low hazard dams with drainage areas less than 250 acres – the 10-year flood.

2) The spillway discharge capacity shall be sufficient to evacuate at least 80% of the volume of water temporarily stored during the principal spillway design flood within 10 days. Where this cannot be accomplished, the emergency spillway and freeboard design flood routings shall be made beginning with the impoundment level at the 10-day drawdown elevation.

3) For dams with emergency spillways of structural concrete or which are excavated into sound rock, a higher frequency of use, and therefore a lower principal spillway design flood, may be permitted if flood control or dam safety would not be adversely affected.

*For dams without emergency spillways, the storage volume and height shall be determined by measuring to the top of dam elevation.

C) Rainfall Depth and Distribution

Precipitation values for various frequency storm events: 10, 25, 50, 100-year and PMP are contained in the Iowa Department of Agriculture and Land Stewardship publication, Climatology of Iowa Series #2, Revised, Iowa Rainfall Frequencies by Paul Waite. Ten-day rainfall amounts are contained in the National Weather Service publication, Technical Paper No. 49.

Some acceptable methods of distributing the rainfall in Iowa are found in the U.S.D.A. Soil Conservation Service publication, TR-60, Earth Dams and Reservoirs; and the Illinois State Water Survey publication, Time Distribution of Rainfall In Heavy Storms by F. A. Huff.

D) Rainfall Losses

Conservative loss rates (interception, infiltration, etc.) and antecedent moisture conditions should be used in computing rainfall excess. Also, when applicable, snowmelt runoff rates should be estimated.

The Soil Conservation Service (SCS) weighted curve number method is acceptable for determining rainfall

losses and is explained in National Engineering Handbook Section 4 Hydrology, SCS, 1972.

E) Storm Duration

Criteria and guidelines for developing design storms from rainfall events are as follows:

1) The critical duration storm or the storm which results in the highest water level in the impoundment, shall be used in determining the freeboard design flood for a high hazard dam.

2) Six hour storms are recommended for determining the freeboard design flood for dams designated in paragraphs A (2) and A (3)"a" of this chapter except where the time of concentration exceeds six hours. The 24-hour storm is recommended for dams designated in paragraph A (3)"b" of this chapter.

3) Twenty-four hour (24-hour) or 10-day storms are recommended for developing principal spillway design floods.

CHAPTER IV
HYDRAULIC AND STRUCTURAL CRITERIA AND GUIDELINES FOR SPILLWAYS

The following criteria and guidelines are design considerations which will be used by the department to insure that spillway structures are capable of functioning safely and efficiently and of resisting the forces to which they may be exposed during the life of the structure.

A) Spillways should be designed to operate safely for the life of the structure and at the discharges and pressures which would be experienced under all normal or flood flow conditions including the freeboard design flood.

B) Anti-seepage collars or other means of piping and seepage control (e.g., drainage diaphragms), anti-vortex devices, trash racks or other inlet debris control measures, and outlet stilling basins should be provided for all conduits unless evidence can be presented establishing they are not necessary.

C) For dams where a conduit is proposed to serve as the principal spillway, suggested minimum sizes of the principal spillway conduit for the indicated type of structure are as follows:

1) High hazard dams and moderate dams classed as major structures – 36-inch inside diameter.

2) Moderate hazard dams not classed as major structures and low hazard dams, which are classed as major structures – 24 inch inside diameter.

3) Low hazard dams not classed as major structures but which have drainage areas of 250 acres or more – 18-inch inside diameter.

4) Low hazard dams with drainage areas under 250 acres – 12-inch inside diameter.

These minimum sizes are applicable to dams with emergency spillways or which are designed for overtopping only. For dams without emergency spillways, substantially larger conduit sizes with special provisions against plugging will normally be required.

D) Drop inlets (risers) should have an inlet cross-sectional area at least 1.5 times that of the conduit and should be constructed of comparable materials.

E) Conduits and risers should be of sufficient strength and have adequate joints to withstand all anticipated

external and internal pressures without damage or leakage, with provisions made for vertical settlement. Conduits should be cambered where significant settlement of the overlying embankment is anticipated. Articulated or bell joints should be provided as necessary to accommodate the maximum elongation estimated to occur during the life of the structure. Risers must be designed to counteract buoyant forces.

F) Corrugated metal pipe conduits and risers should be close riveted with watertight connecting bands and should be fiber bonded, asphalt coated, or given equivalent protection. Cathodic protection shall be provided in corrosive soils. Corrugated metal pipe (CMP) conduits are not recommended for high hazard dams, moderate hazard dams classed as major structures, or where the height of earth fill over the conduit exceeds 25 feet.

G) Concrete conduit and drop inlet (riser) design using precast pipe sections should specify reinforced concrete pressure pipe.

H) Open concrete spillways, concrete box conduits, and concrete flumes or chutes should have longitudinal curbs or raised joints which will prevent contact by normal flows with the construction joint between the floor and wall slabs. Seepage barriers, drainage blankets and drains should be installed where needed to maintain hydraulic flow integrity through the structure and to accommodate anticipated settlement or elongation in the longitudinal or transverse directions.

I) Emergency spillways should be capable of safely conveying excess flood flows around or through the dam. They should not operate except at floods greater than the principal spillway design flood.

J) Earth emergency spillways should be subject to the following minimum requirements at the control section:

1) Minimum bottom width – 10 feet.

2) On major structures, minimum depth – 3 feet. On other structures, minimum depth – 2 feet. (Elevation of top of dam minus elevation of emergency spillway crest.)

3) The profile through the emergency spillway should be horizontal for at least 30 feet through the crest control section.

4) Exit channel slopes should not be less than 1% or greater than 10%, but should provide for maintaining critical depth control at the crest.

K) For dams where substantial erosion in the emergency spillway would pose the risk of a dam failure, the flow velocities during the freeboard design flood should be non-erosive. Where such erosion would pose no substantial risk of failure, the flow velocities should be non-erosive at the discharge which occurs when flow through the control section is at 30% of the maximum depth. On vegetated spillways, the non-erosive velocity should be determined assuming the vegetation is well established.

L) Emergency spillways should be constructed in undisturbed soil wherever possible. Where no viable alternative is available, they may be constructed on fill as a ramp spillway.

M) Smooth transitions in horizontal and vertical alignment should be provided at and between the inlet, the control at the crest and the outlet sections of emergency spillways.

N) All spillways should discharge a safe distance from the toe of the dam, and the inlets and outlets should be so located and aligned as to minimize risk of erosion damage to the dam or of damage to downstream buildings, roads, dams or other structures.

O) An adequate energy dissipation structure (stilling basin) or an alternative acceptable method should be incorporated at the outlet of all structural spillways. On major structures, uplift analysis and arching requirements should be considered.

CHAPTER V
EMBANKMENTS

The earth embankment of a dam should be designed and built according to the following criteria and guidelines.

A) Foreslopes and Backslopes. Embankments should be built of suitable materials and with stable slopes. Foreslopes should not be steeper than 3:1 (horizontal to vertical) in till or loess soils below the permanent water level. Above the permanent water level, foreslopes should not be steeper than 2.5:1 in till soil or 3:1 in loess soil. Backslopes should not be steeper than 2.5:1 in till soils or 3:1 in loess soils. Steeper foreslopes or backslopes may be used if justified by soil tests and stability analysis.

B) Settlement Allowance. A minimum vertical settlement allowance of five percent of the depth of fill should be provided unless a lesser amount is justified by soil tests.

C) Top Width. The minimum embankment top width should be 14 feet for dams 25 feet high or higher. As a rule of thumb, the top width could be reduced by two feet for every five feet of reduction in the height of the dam to a minimum width of eight feet. The top width of dams with roads across the crest should be consistent with normal roadway design practices, including roadway and shoulders.

D) Core Trench. Core trenches should be located approximately along the centerline (axis) of the earth fill. It should be continuous across the base of the fill extending into and up the side slopes of the dam abutments to normal reservoir level. The core trench should be excavated to a minimum depth of five feet or until a suitable base material is reached. The base width should be that which will accommodate excavating equipment, but not less than eight feet. The side slopes of the core trench should not be steeper than 1:1, regardless of depth or width of base. Impervious material shall be used in backfilling the core trench.

E) Wave Erosion Protection. On the upstream face of the dam, a horizontal bench or berm at least 10 feet wide usually should be provided at the normal pool elevation to limit damage from wave erosion. On larger impoundments, riprap or other physical means of protection should be considered whether or not the berm is provided.

F) Site Preparation. All vegetation, sod, stumps, and large roots should be removed from the embankment site, and the ground surface scarified to provide bond with the earth fill. Overhanging banks, pits, or holes should be sloped and graded so slopes do not exceed 1:1, and any other sharp discontinuities in the ground surface shall be smoothed. Special consideration should be given to the removal of sandy or mucky deposits unless otherwise provided for in the design.

In till soils, topsoil should be saved and placed as a surface layer over the finished embankment to provide an adequate seed base in establishing vegetation.

G) Fill. Fill material should be clean earth containing no appreciable amounts of vegetation, large rock, frozen material or other foreign substances. Fill should not be placed on a frozen foundation or in freezing weather.

Moisture content of the fill should be sufficient to assure adequate compaction. A moisture content slightly higher than optimum is recommended. An above optimum moisture content is desirable from the standpoint of providing a more plastic embankment capable of resisting greater differential settlement without experiencing

potentially hazardous cracking. Unless otherwise specified after soil testing, fill should be placed in horizontal lifts not exceeding eight inches extending over the entire fill area and compacted by not less than four overlapping passes by sheepsfoot or rubber tired rollers. Smooth steel rollers or passes by caterpillar tracks are not considered adequate for compaction of earth-fill dams. The surface of the fill should be scarified or roughened if sufficient time elapses between lifts for a crust to develop.

Backfill adjacent to spillway structures and anti-seep collars should be carefully placed and compacted by hand equipment. Heavy equipment shall not pass over conduit structures until two feet of compacted earth cover is in place.

H) Drains. Internal seepage control drains are recommended for all dams and are normally required on major structures unless soils investigation finds they are not needed. Drains should be capable of preventing saturation of the downstream portion of the embankment by intercepting any seepage through the fill or the foundation and any seepage along structural spillways or conduits.

If springs are encountered during site preparation, drains should be provided to allow a controlled outlet.

I) Seeding. As soon as possible after earth fill for the embankment is completed, the embankment and any other exposed areas should be seeded. Mulch or other means of erosion control can be placed as part of seeding and maintained until vegetation is established. Grass or vegetative species selected for use should be appropriate for the soils and conditions expected at the site. Crown vetch is generally not acceptable for dam embankments or emergency spillways.

J) Riprap. Riprap shall be designed for its expected use and anticipated water velocities. All riprap should be placed on a properly designed bedding unless the gradation of the underlying base material is such that it will not infiltrate through the riprap, or an acceptable filter fabric is used.

K) Groins. Where the embankment foreslopes and backslopes intersect the natural or modified abutment slopes, appropriate groin design and erosion control recommendations should be provided.

Embankments composed of concrete, rock, or other materials, as associated with gravity, rockfill and arch dams, designed in accordance with standards by the U.S. Army Corps of Engineers, U.S.D.A. Soil Conservation Service, or the U.S. Bureau of Reclamation are generally acceptable. These types of dams are not normally constructed in Iowa.

CHAPTER VI
SPECIAL REQUIREMENTS FOR MAJOR DAM STRUCTURES

Because of the size, public importance, or potential hazard of a major dam structure, a higher level of investigation, design and assurance of proper construction is needed. A major dam structure is defined as a dam meeting any of the following criteria.

1. Any high hazard dam.

2. Any moderate hazard dam with a permanent storage exceeding one hundred (100) acre-feet or a total of permanent and temporary storage exceeding two hundred fifty (250) acre-feet at the top of the dam elevation.

3. Any dam, including low hazard dams, where the height of the emergency spillway crest measured above the elevation of the channel bottom at the centerline of the dam (in feet) multiplied by the total storage volume (in acre-feet) to the emergency spillway crest elevation exceeds 30,000. For dams without emergency spillways, these measurements shall be taken to the top of dam elevation.

As a condition of permit approval, the following items will be required for major dam structures.

A) A soils and foundation investigation shall be made which includes the evaluation of slope stability requirements, anticipated vertical

settlement and horizontal elongation, seepage and under-seepage potential, whether cathodic protection is needed for metal pipes, and proper construction practices for the soil types and conditions encountered. Stability evaluation shall include end of construction, steady state seepage and sudden drawdown conditions.

B) Anticipated sedimentation rates and their impact on the life and usefulness of the impoundment shall be investigated. Sediment storage shall be provided in the volume necessary for continuation of design uses of the impoundment throughout its design life.

C) A gated low level outlet shall be provided which is capable of draining at least 50 percent of the permanent storage behind the dam within a reasonable length of time. The pipe conduits shall be designed so that negative pressures will not occur at any point along the system.

D) In order to assess the degree of threat to life and property located downstream of the dam, a dam breach analysis may be required. The analysis will be made to determine the most adverse failure condition and the resulting peak outflows and water surface elevations downstream of the dam following failure of the dam during the freeboard design storm.

E) Construction shall be inspected by an engineer registered under Chapter 114 of the Code of Iowa or by a trained inspector under the supervision of the engineer. The engineer shall prepare and certify as-built plans after completion and a report detailing any unusual circumstances encountered during construction and submit them to the Department of Natural Resources, ATTN: Flood Plains.

F) The applicant, as a condition of the permit, shall submit an annual maintenance and inspection report. The report shall describe maintenance work done since the previous annual report, describe any deficiencies observed in the dam or appurtenant structures, detail the remedial measures necessary and the method and time the applicant proposes to correct the deficiencies found. If there is a change in the land use downstream of the dam, this change should be noted on the annual maintenance and inspection report. The applicant may also be required to provide additional inspections and reports by an engineer or other qualified personnel.

CHAPTER VII
SPECIFICATIONS

When detailed project specifications are prepared, they should include the following information.

A) The general provisions which specify the rights, duties, and responsibilities of the owner, applicant, applicant's engineer, and builder or contractor, and the prescribed order of the work.

B) The technical provisions which describe approved work methods, equipment, materials and desired end results.

C) Special provisions as may be required which describe those technical details that are not usually contained in standard technical provisions.

CHAPTER VIII
DAM BREACH ANALYSIS

A) In some cases, it will be necessary to evaluate the consequences of a dam failure to verify hazard classification or adequacy of design. A special case of dam breach analysis will involve failure or improper operation of flood control gates or other structures.

B) Where such evaluations are made by the department's staff, the necessary data will be obtained from topographic maps or other available information. If that information is not adequate, the applicant may be required to obtain additional downstream survey data.

C) Prediction of the downstream consequences of a hypothetical dam breach requires several component steps: development of the impoundment inflow hydrograph; routing the hydrograph through the impoundment; selecting failure conditions for the structure; calculating the outflow hydrograph from the failed structure; and modeling movement of the flood wave downstream to determine travel time, inundated areas, maximum water surface elevations, etc.

D) The criteria, methodology, and computer programs developed by the U.S. Corps of Engineers, the National Weather Service, the U.S.D.A. Soil Conservation Service, and the U.S. Geological Survey for simulating a hypothetical dam failure are, in general, acceptable.

CHAPTER IX
OPERATING PLAN

For any dam with gates or other moveable structures which must operate or be operated during times of flood or to provide a minimum downstream release rate, a written operating plan shall be prepared. Development of such a plan is considered part of the design process. The following shall be addressed in preparation of the operating plan.

A) Responsibility

No operating plan can be expected to work properly unless it can be assured the necessary personnel will be present to operate the equipment, or, in the case of automatic equipment, to monitor it and insure it is functioning properly.

The plan shall identify who is responsible for operating and monitoring the equipment and provide means to assure the necessary personnel are present when needed.

B) Operating Circumstances

The circumstances under which operation must occur shall be clearly defined, and a means provided to insure that operating personnel are present when necessary.

C) Method of Operation

The means and methods by which operation is to be conducted shall be clearly defined. Included shall be such items as rates and sequences for opening or closure of gates, pool level vs. gate setting tables, etc., as required.

The operating plan shall allow for safe passage of all floods up to and including the freeboard design flood. Flood discharges through the dam greater than the design peak flood inflows into the impoundment shall not be permitted. In design and analysis, due consideration shall be given to the potential impacts of the operating procedure on both downstream and poolside lands.

The plan should also address low flow situations and should specify a minimum release rate and how it will be provided and maintained.

Consideration shall also be given to and allowance made for the possible failure of or malfunctioning of the equipment.

D) Discharge Measurement

A means shall be provided to determine the discharge through the control structures, especially where operation is to maintain a minimum downstream flow. Control setting vs. discharge tables, streamflow gages or other means of obtaining discharge readings shall be provided. The settings of control structures shall be easily read.

CHAPTER X
LANDS, EASEMENTS, RIGHTS-OF-WAY*

The determination of lands, easements, and rights-of-way required for the construction, operation and maintenance of a dam project are considered part of the design process. An application for approval of a dam project shall include information showing the nature and extent of lands, easements, and rights-of-way, which the applicant has acquired or proposes to acquire for the project. Acquisition of lands, easements or rights-of-way for construction, operation, and maintenance of a dam project shall be consistent with the following criteria.

A) Ownership or perpetual easements shall be obtained for the area to be occupied by the dam embankment, spillways and appurtenant structures, and the permanent or maximum normal pool.

B) Ownership or easements shall be obtained for temporary flooding of areas which would be inundated by the flood pool up to the top of dam elevation and for spillway discharge areas.

C) Easements covering areas affected by temporary flooding or spillway discharges shall include provisions prohibiting the erection and usage of structures for human habitation or commercial purposes without prior approval by the Department of Natural Resources.

D) In locating the site of a dam and in obtaining easements and rights-of-way, consideration should be given to the impacts which changes in land use downstream of a dam and adjacent to the impoundment could have on the hazard class of the dam, the operation of the dam, and the potential liability of the dam owner.

E) The applicant may be required to acquire control over lands downstream from the dam as necessary to prevent downstream development which would affect the hazard class of the dam.

*This chapter is substantively identical to 567—72.3(2)"b", Iowa Administrative Code.

CHAPTER XI
HYDROLOGIC AND HYDRAULIC DESIGN REFERENCES

General

Handbook of Applied Hydrology by Ven Te Chow, McGraw-Hill Book Company, 1964.

Handbook of Applied Hydraulics by David and Sorensen, McGraw-Hill Book Company, 1969.

Handbook of Hydraulics by King and Brater, McGraw-Hill Book Company, 1963.

Water Resources Engineering by Linsley and Franzini, McGraw-Hill Book Company, 1963.

U.S. Department of Interior, Bureau of Reclamation

Design of Arch Dams, 1977.

Design of Gravity Dams, 1976.

Design of Small Canal Structures, 1974; Revised Reprint, 1978.

Design of Small Dams, 2nd Edition, 1973; Revised Reprint, 1977.

Discharge Coefficients for Irregular Overfall Spillways, Engineering Monograph No. 9, 1952.

Hydraulic Design of Stilling Basins and Energy Dissipators, Engineering Monograph No. 25, 1978.

Unitgraph Procedures, 1965.

Interim Guidelines for Preparing Inundation Maps for Areas Downstream of Bureau of Reclamation Dams.

Corps of Engineers

Engineering Manuals (EM):

EM 1110-2-1411 Standard Project Flood Determinations.

EM 1110-2-1602 Hydraulic Design of Reservoir Outlet Structures.

EM 1110-2-1603 Hydraulic Design of Spillways.

EM 1110-2-1908 Instrumentation of Earth and Rockfill Dams.

EM 1110-2-2200 Gravity Dam Design.

EM 1110-2-2300 Earth and Rockfill Dams General Design and Construction Considerations.

EM 1110-2-50 Low Level Discharge Facilities for Drawdown of Impoundments.

EM 1110-2-1450 Hydrologic Frequency Estimates.

ETL 1110-2-221 Wave Runup and Wind Setup on Reservoir Embankments.

Mining Enforcement and Safety Administration

Engineering and Design Manual, Coal Refuse Disposal Facilities, 1975.

Soil Conservation Service

National Engineering Handbook:

Section 4 – Hydrology

Section 5 – Hydraulics

Section 11 – Drop Spillways

TR-39 Hydraulics of Broad-Crested Spillway

TR-48 Computer Program for Project Formulation-Structure Site Analysis "DAMS-2"

TR-49 Criteria for the Hydraulic Design of Impact Basins

TR-52 A Guide for Design and Layout of Earth Emergency Spillways

TR-55 Urban Hydrology for Small Watersheds

TR-59 Hydraulic Design of Riprap Gradient Control Structures

TR-60 Earth Dams and Reservoirs

TR-61 Computer Program for Water Surface Profiles

TR-66 Simplified Dam Breach Routing Procedure

DN-8 Entrance Head Losses in Drop-Inlet Spillways

SMN-1 Tentative Guides for Determining the Gradation of Filter Materials

National Weather Service

Technical Paper No. 40 – Rainfall Frequency Atlas of the United States (for Duration from 30 minutes to 24 hours and Return Periods from 1 to 100 years), 1961.

Technical Paper No. 49 – Two to Ten Day Precipitation for Return Periods of 2 to 100 Years in the Contiguous United States, 1964.

Hydrometeorological Report No. 51 – Probable Maximum Precipitation Estimates, United States East of the 105th Meridian, June 1978.

DAMBRK: NWS Dam-Break Flood Forecasting Model, November 1979.

Illinois State Water Supply

Precipitation Relations for Use in Dam Safety Project by Floyd Huff, 1980.

Time Distribution of Rainfall in Heavy Storms by Floyd Huff, 1967.

Iowa Department of Agriculture and Land Stewardship

Climatology of Iowa Series #2, Revised, Iowa Rainfall Frequencies by Paul Waite, 1988.

Climatology of Iowa Series No. 3 – Iowa's Greatest 24-Hour Precipitation and Related Storm Data by Paul Waite and Paul Jaeger, 1981.

United States Geological Survey

Bulletin No. 7 – Drainage Areas of Iowa Streams by O.J. Larimer, Reprinted, March 1974.

Bulletin No. 12 – Floods in Iowa, A Comparative Study of Regional Flood Frequency Methods by Oscar G. Lara, 1974.

Water Resources Investigation Report 87-4132 – Method for Estimating The Magnitude and Frequency of Floods at Ungaged Sites on Unregulated Rural Stream In Iowa, by Oscar G. Lara, 1987.

Federal Highway Administration

Hydraulic Engineering Circulars:

HEC No. 10 – Capacity Charts for the Hydraulic Design of Highway Culverts, November 1972.

HEC No. 11 – Use of Riprap for Bank Protection, June 1967.

HEC No. 13 – Hydraulic Design of Improved Inlets for Culverts, August 1972.

HEC No. 14 – Hydraulic Design of Energy Dissipator for Culverts and Channels, December 1975.

HEC No. 15 – Design of Stable Channels with Flexible Linings, October 1975

Hydraulic Design Series No. 1 – Hydraulics of Bridge Waterways, 2nd Edition, 1970.

Hydraulic Design Series No. 3 – Design Charts for Open Channel Flow, 1973.

Hydraulic Design Series No. 4 – Design of Roadside Drainage Channels, 1965.

Hydraulic Design Series No. 5 – Design of Highway Culverts, September 1985.

Agricultural Research Service

The SAF Stilling Basin, 1959.
Hydraulics of Closed Conduit Spillways, Parts I – XVII.

567—71.3(455B) Dams. Approval by the department for construction, operation, or maintenance of a dam in the floodway or flood plain of any water source shall be required when the dimensions and effects of such dam exceed the thresholds established by this rule. EXCEPTION: Public road embankments with culverts which impound water only in temporary storage are exempt from the requirements of this rule and shall be reviewed under rules 567—71.1(455B) and 567—72.1(455B). Approval required by this rule shall be coordinated with approval for storage of water required by 567—Chapter 51. Approval by the department shall be required in the following instances:

71.3(1) *Rural areas.* In rural areas:

a. Any dam designed to provide a sum of permanent and temporary storage exceeding 50 acre-feet at the top of dam elevation, or 25 acre-feet if the dam does not have an emergency spillway, and which has a height of 5 feet or more.

b. Any dam designed to provide permanent storage in excess of 18 acre-feet and which has a height of 5 feet or more.

c. Any dam across a stream draining more than 10 square miles.

d. Any dam located within 1 mile of an incorporated municipality, if the dam has a height of 10 feet or more, stores 10 acre-feet or more at the top of dam elevation, and is situated such that the discharge from the dam will flow through the incorporated area.

71.3(2) *Urban areas.* Any dam which exceeds the thresholds in 71.3(1)*"a," "b"* or *"d."*

71.3(3) *Low head dams.* Any low head dam on a stream draining 2 or more square miles in an urban area, or 10 or more square miles in a rural area.

71.3(4) *Modifications to existing dams.* Modification or alteration of any dam or appurtenant structure beyond the scope of ordinary maintenance or repair, or any change in operating procedures, if the dimensions or effects of the dam exceed the applicable thresholds in this rule. Changes in the spillway height or dimensions of the dam or spillway are examples of modifications for which approval is required.

71.3(5) *Mill dams.* Rescinded IAB 2/20/91, effective 3/27/91.

71.3(6) *Maintenance of preexisting dams.* Approval shall be required to maintain a preexisting dam as described in 567—Chapter 73 only if the department determines that the dam poses a significant threat to the well-being of the public or environment and should therefore be removed or repaired and safely maintained. Preexisting dams are subject to the water, air and waste management dam safety inspection program as set forth in 567—Chapter 73.

This rule is intended to implement Iowa Code sections 455B.262, 455B.264, 455B.267, 455B.275 and 455B.277.

E.15. Kansas

Agency 5

Kansas Department of Agriculture—Division of Water Resources

Articles

5-24. Northwest Kansas Groundwater Management District No. 4.
5-40. Design of Earth Dams.
5-42. Design of Stream Obstructions.
5-44. Floodplain Management.

Article 24.—NORTHWEST KANSAS GROUNDWATER MANAGEMENT DISTRICT NO. 4

5-24-10. Exemptions for up to 15 acre-feet of groundwater. (a) In any area of the district that is subject to safe yield criteria and is not closed by specific regulation or intensive groundwater use control area order by the chief engineer to new nondomestic, nontemporary permits and term permits for five or fewer years, each application to appropriate groundwater shall be exempt from meeting the safe yield criteria if all the following conditions are met:

(1) The maximum annual quantity of water proposed in the application is 15 acre-feet or less.

(2) The well spacing criteria of K.A.R. 5-24-3 have been met.

(3) An existing water right from the same source of water supply that has a point of diversion located within two miles of the proposed point of diversion has its authorized annual quantity reduced as described in subsection (b).

(4) All issues relating to the possible abandonment of the offsetting water right are resolved by the chief engineer before determining the annual quantity of offset water that is available from the existing water right.

(5) The approval of the application does not authorize an additional quantity of water out of an existing authorized well with a nondomestic permit or water right that would result in a total combined annual quantity of water authorized from that well in excess of 15 acre-feet.

(6) The approval of the application does not authorize an additional quantity of water to be used on a currently authorized nondomestic place of use.

(b) If the water right to be used as the offset for the new appropriation is a water right authorized for irrigation use, the authorized quantity of water needed to offset the new appropriation of not more than 15 acre-feet of water shall be calculated as follows:

(1) Step one.

(A) Multiply the net irrigation requirement for the 50 percent chance rainfall for the county of origin, as specified in K.A.R. 5-5-12, times the maximum number of acres legally irrigated in any one calendar year during the perfection period. For vested rights, the acreage used shall be the maximum acreage legally irrigated in any one calendar year before June 28, 1945.

(B) The calculation made in paragraph (b)(1)(A) shall result in the maximum annual quantity of water that could be changed to another type of beneficial use if the entire water right were changed pursuant to K.A.R. 5-5-9(a)(1).

(2) Step two.

(A) Divide the annual quantity of water desired to be changed to the new beneficial use by the maximum annual quantity of water that could be changed if the entire water right were changed to the new use.

(B) The calculation made in paragraph (b)(2)(A) shall result in the percentage of the entire reduced water right that will be changed to the new use. The remaining percentage of the current water right may be retained by the irrigation water right owner.

(3) Step three.

(A) Multiply the remaining percentage calculated in paragraph (b)(2)(B) times the total currently authorized quantity. The resulting product

shall be the annual quantity of water that can be retained by the irrigation water right owner.

(B) The portion of the authorized annual quantity of water not retained by the irrigator as described in paragraph (b)(3)(A) shall be permanently reduced from the authorized annual quantity of the offsetting water right and used to offset the new appropriation.

(c) If the water right to be used as the offset for the new appropriation is an existing water right authorized for nonirrigation use, the total net consumptive use of the offsetting water right after the change and the new appropriation shall not exceed the net consumptive use of the offsetting water right before the change.

(d) The place of use authorized by the offsetting water right shall be reduced in proportion to the reduction in the maximum annual quantity of water as determined in paragraph (b)(1)(B). If the owner of the irrigation water right desires to retain more authorized acres, the directions specified in K.A.R. 5-5-11(b)(2)(B)(ii) shall be followed to determine whether the irrigator may retain more acres in the authorized place of use.

(e) After the use of not more than 15 acre-feet has been approved pursuant to this regulation, no application for change for that water right shall be approved for any quantity of water that would authorize the water to be diverted from a currently authorized point of diversion or to be used on a currently authorized place of use. (Authorized by K.S.A. 82a-706a and K.S.A. 2005 Supp. 82a-1028; implementing K.S.A. 2005 Supp. 82a-1028; effective Jan. 10, 2003; amended Dec. 8, 2006.)

Article 40.—DESIGN OF EARTH DAMS

5-40-1. Definitions. As used in K.S.A. 82a-301 through 82a-305a and amendments thereto, in the regulations adopted pursuant to these statutes, and by the chief engineer in administering K.S.A. 82a-301 through 82a-305a and amendments thereto, the following terms shall have the meanings ascribed to them in this regulation, unless the context clearly requires otherwise:

(a) "Application" means the formal document and any required supporting information that are submitted to the chief engineer and request a permit, pursuant to K.S.A. 82a-301 through 82a-305a, and amendments thereto.

(b) "Appurtenant works" means the primary spillway and other conduits through a dam, the valves, the auxiliary spillway, the service spillway, the stilling basin, any constructed outlet channel, all dikes and berms designed and constructed to protect the dam, the drains, and all other features constructed to protect or operate a dam.

(c) "As-built drawings" means the drawings showing a permitted project and all appurtenant works as the project and works were actually built. This term shall include the following:

(1) All deviations from the plans that were approved by the chief engineer;

(2) the location and design of any instruments and monitoring equipment that were installed at the site;

(3) the location and elevation of any benchmarks; and

(4) a certification that the permitted project was constructed as shown on the as-built drawings.

(d) "Authorized representative" means any employee of the chief engineer designated by the chief engineer to perform duties and functions on behalf of the chief engineer.

(e) "Auxiliary spillway" means an open channel that is constructed over or around an embankment for the purpose of conveying safely past the dam the flows that are greater than the primary spillway design discharge and that can be stored in the detention storage. This term is also known as an emergency spillway.

(f) "Benchmark" means a reference point or object of known elevation and location that is not expected to move horizontally or vertically during the life of the project.

(g) "Borrow area" means land, usually located near the dam, from which earth used to construct the embankment will be excavated.

(h) "Breach analysis" means an engineering analysis to determine the areas that would be inundated if a dam failed.

(i) "Channel change" means any project that alters the course, current, or cross section of any stream.

(j) "Chief engineer" means the chief engineer, division of water resources of the Kansas department of agriculture.

(k) "Control section" means the immediate downstream end of the level section of an open-channel earthen spillway. The elevation of the control section is the elevation of the open-channel spillway crest.

(l) "Cutoff collar" means a projecting flange built or installed completely around the outside of a pipe to lengthen the path of seepage along the outer surface of the pipe.

(m) "Cutoff trench" means an excavation under a dam to be later filled with impervious material to prevent or reduce the seepage of water through the foundation of a dam.

(n) "Design discharge" means the maximum rate of flow, expressed in cubic feet per second, released from a dam's spillways for the design storm.

(o) "Design storm" means the precipitation event specified in K.A.R. 5-40-22 that is the minimum precipitation event required to be used to design a particular dam.

(p) "Detention storage" means the volume in the reservoir between the lowest uncontrolled spillway, not including any low-flow augmentation works, and the crest of the auxiliary spillway.

(q) "Detention storm" means the storm described in K.A.R. 5-40-23.

(r) "Easily erodible soils" means soils with a high content of fine sand or silt and with little or no cohesion or plasticity, including fine sand, silt, sandy loam, and silty loam.

(s) "Effective height" means the difference in elevation between the crest of an auxiliary spillway or service spillway and the lowest point of the downstream toe of a dam. If the dam does not have an auxiliary or service spillway, the effective height means the difference in elevation between the top of the dam and the lowest point of the downstream toe of the dam.

(t) "Effective storage" means the volume of storage space in a reservoir below the crest of the auxiliary spillway or service spillway and above the elevation of the downstream toe of the dam at its lowest point. Effective storage shall not be reduced by accounting for accumulated sediment.

(u) "Embankment" means the earthen-fill portion of the dam.

(v) "Emergency action plan" means a formal document that identifies potential emergency conditions at a dam and specifies preplanned actions to be followed to minimize property damage and loss of life if the dam fails.

(w) "Erosion-resistant soils" means cohesive soils with a high clay content and high plasticity, including silty clay, sandy clay, and clay.

(x) "Freeboard" means the vertical distance between the maximum water surface elevation attained during the design storm and the top of the dam.

(y) "General plan" means a plan adopted by a watershed district, drainage district, or similar entity required by statute to be approved by the chief engineer, including any of the plans formulated under K.S.A. 24-901 and K.S.A. 24-1213, and amendments thereto.

(z) "Hazard" means the property or people that could be damaged or endangered by the failure of a dam, including people or property that might be inundated. This term shall include a public or industrial water supply stored in the reservoir created by the dam that would be released if the dam failed.

(aa) "High-impact dams" means all of the following classes of dams:

(1) Size class 4, hazard class A dams;

(2) size classes 3 and 4, hazard class B dams; and

(3) all hazard class C dams, using the definitions of hazard class and size class in K.A.R. 5-40-20 and K.A.R. 5-40-21.

(bb) "Hydraulically most distant point in the watershed" means the point in a watershed from which a raindrop falling at that point takes the longest time to reach the dam.

(cc) "Impervious material" means material that allows a relatively low rate of water movement through its cross section.

(dd) "Inspection year" means the period on and after May 1 of one year through April 30 of the following year. The inspection year shall be named for the calendar year in which the inspection year ends.

(ee) "Inundation area" means the area below a dam that will be inundated with water as determined by conducting a breach analysis meeting the requirements specified in K.A.R. 5-40-24.

(ff) "Invert" means the lowest point on the inside of the outlet of a conduit.

(gg) "Low-flow augmentation works" means any uncontrolled conduit, orifice, or other appurtenant works that slowly release water from storage in a reservoir, or bypass low flow through a reservoir.

(hh) "Low-impact dams" means all of the following classes of dams:

(1) Size classes 1, 2, and 3, hazard class A dams; and

(2) size classes 1 and 2, hazard class B dams, using the definitions of hazard class and size class in K.A.R. 5-40-20 and K.A.R. 5-40-21.

(ii) "Maintenance" means the actions or upkeep performed on a dam or its appurtenances to compensate for wear and tear on the dam and appurtenances and to preserve the dam and appurtenances so that the dam and appurtenances

function properly until they are removed, including woody vegetation control; grass seeding; burrowing animal control; repair of minor erosion, cracks, animal burrows, and minor settling; care of pipes, piezometers, drains, valves, gates, and other mechanical devices; replenishment of riprap; and removal of debris from spillways.

(jj) "Modification" means any change in a dam or its appurtenances that involves a change to or significant disturbance of the embankment, an alteration of the flow characteristics of a spillway, a change in the storage capacity or freeboard, or any other significant alteration in the functioning of the dam.

(kk) "Navigable stream" means any of the following:

(1) The Arkansas river;

(2) the Missouri river; or

(3) the Kansas river.

(ll) "One percent-chance storm" means a rainfall event that has a one percent chance of being equaled or exceeded one or more times in a year.

(mm) "Owner of a dam" means the owner or owners of the land upon which a dam and appurtenant works are constructed unless an easement authorizes another person or entity to construct and maintain a dam on that easement. With such an easement, the holder of the easement shall be considered to be the owner of the dam.

(nn) "Perennial stream" means a stream, or part of a stream, that flows continuously during all of the calendar year, except during an extreme drought.

(oo) "Permanent pool" means the storage space in a reservoir below the elevation of the lowest uncontrolled spillway, not including any low-flow augmentation works. This term is also known as the "normal pool."

(pp) "Permit" means the consent or other formal document issued by the chief engineer that authorizes the construction, repair, or modification of a dam, channel change, or stream obstruction, and its operation and maintenance.

(qq) "PMP" means the probable maximum precipitation that can occur in a precipitation event as prescribed by K.A.R. 5-40-31.

(rr) "Prejurisdictional dam" means any of the following:

(1) A dam constructed before May 28, 1929;

(2) a dam constructed by an agency or political subdivision of state government, other than a county, city, town, or township, before April 11, 1978; or

(3) a dam constructed before July 1, 2002 that is 25 or more feet in height and impounds less than 30 acre-feet of water at the top of the dam.

(ss) "Primary spillway" means the uncontrolled outlet device through a dam that provides the initial outlet for storm flows, usually consisting of either of the following:

(1) A riser structure in combination with an outlet conduit; or

(2) a canopy or hooded inlet structure in combination with an outlet conduit.

This term is also known as a "principal spillway."

(tt) "Rainfall excess" means that part of the rain in a given storm that falls at intensities exceeding the infiltration capacity of the land and that is the volume of the rain available for direct runoff.

(uu) "Reservoir" means the area upstream from a dam that contains, or can contain, impounded water.

(vv) "Repair" means any action, other than maintenance, taken to restore a dam and its appurtenant works to their original permitted condition.

(ww) "Service spillway" means an open-channel spillway constructed over or around a dam embankment to convey safely past the dam all flows entering the reservoir that cannot be stored in the reservoir behind a dam that does not have a primary spillway.

(xx) "Size factor" means the effective height of the dam, expressed in feet, multiplied by the effective storage of the reservoir, expressed in acre-feet.

(yy) "Stilling basin" means an open structure or excavation at the outlet of a spillway that dissipates the energy of fast-moving water being discharged from the spillway to protect the streambed below a dam from erosion.

(zz) "Stream" means any watercourse that has a well-defined bed and well-defined banks and that has a watershed above the point marking the site of the project that exceeds the following number of acres in the zones specified:

(1) Zone three: 640 acres for all geographic points within any county west of a line formed by the adjoining eastern boundaries of Phillips, Rooks, Ellis, Rush, Pawnee, Edwards, Kiowa, and Comanche counties;

(2) zone two: 320 acres for all geographic points within any county located east of zone three and west of a line formed by the adjoining eastern boundaries of Republic, Cloud, Ottawa, Saline,

McPherson, Reno, Kingman, and Harper counties; and

(3) zone one: 240 acres for all geographic points within any county located east of zone two.

The flow of a stream is not necessarily continuous and can occur only briefly after a rain in the watershed. If the site of the project has been altered so that a determination of whether the well-defined bed and banks did exist is not possible, it shall be presumed that the bed and banks did exist if the watershed acreage criteria specified in this subsection have been met, unless the owner of the project conclusively demonstrates that the well-defined bed and banks did not exist when the project site was in its natural state and had not been altered by human activity.

(aaa) "Stream obstruction" means any project or structure that is wholly or partially placed or constructed in a stream and that does not meet the definition of a dam in K.S.A. 82a-301 and amendments thereto.

(bbb) "Time of concentration" means the time required for runoff to flow from the hydraulically most distant point in the watershed to the watershed outlet once the soil has become saturated and minor depressions have been filled.

(ccc) "Trash rack" means a protective device installed on the inlet of a primary spillway to prevent trash and other debris from obstructing the primary spillway without obstructing the flow of water.

(ddd) "Watershed" means all of the area draining toward a selected point on a stream.

(eee) "Wing dike" means an earthen or rock structure below the toe of a dam that is constructed to protect the embankment from erosion.

(fff) "Zone," in an earthen dam, means a segment of earthen fill containing similar materials.

(ggg) "Zoned fill" means an embankment divided into two or more zones to make the best use of available materials. (Authorized by and implementing K.S.A. 2006 Supp. 82a-303a; effective May 1, 1983; amended May 1, 1987; amended, T-5-12-30-91, Dec. 30, 1991; amended Feb. 17, 1992; amended Sept. 22, 2000; amended May 18, 2007.)

5-40-2. Dams; plans and specifications. The plans required by K.S.A. 82a-302, and amendments thereto, to construct, repair, or modify a dam shall include sufficient views to show all features in three dimensions and in sufficient detail to instruct a competent contractor to construct, repair, or modify the dam by viewing the plans and specifications. All plans with multiple pages shall include an index describing the location of required views within the plans. The views and maps specified in this regulation shall be shown. Specific details shall be listed under the view that is typically most appropriate, but they may be displayed on another view to improve the legibility of the plans if sufficient detail is provided in the plans to describe each feature in three dimensions. The required plans shall include the following:

(a) Plan views of the dam and dam site, which shall include both abutments of the dam, the area downstream to the point where the auxiliary spillway or service spillway flows enter the receiving channel, and the area upstream of the upstream toe of the dam to where the borrow area will be permitted. All elevations shown on plans shall be referenced to the same datum as the benchmarks described on the plans. The following details shall be shown, if applicable:

(1) The location of the axis of the dam, showing stationing and top width limits;

(2) the toe of the upstream and downstream slopes;

(3) the location of the centerline and the limits of each open-channel spillway;

(4) the location of the primary spillway and any stilling basin;

(5) the location of each berm;

(6) the location of slope protection;

(7) the location of borings, test holes, and test pits;

(8) the location of intakes, outlets, valves, and valve wells;

(9) the location, description, and elevation of each benchmark;

(10) the location, description, and details of all foundation drains;

(11) the location and limits of each borrow area; and

(12) the location and topography of the area where the auxiliary spillway discharge returns to the receiving stream;

(b) a map of the drainage pattern above and below the dam site drawn to an appropriate scale. The map shall show the following:

(1) The location of the watercourse across which the dam is to be built and the point where the centerline of the dam crosses the centerline of the stream specified in latitude and longitude,

or in feet north and west of the southeast corner of the section;

(2) the location of the dam and the outline of the reservoir;

(3) the boundary of the watershed, shown by a line enclosing the entire area that will drain into the reservoir;

(4) section lines, with sections properly identified; and

(5) the size of the drainage area in acres or square miles;

(c) a topographic map of the dam site and reservoir area, which shall be shown to a scale that provides sufficient detail to clearly show the required features and to locate them in the field, but in no case is less than 1 to 3,600. The elevation of each contour shall be clearly noted on the map. The following details shall be shown:

(1) The location of the dam; and

(2) the following topography:

(A) The contours at two-foot intervals. For dams more than 20 feet in height, contours may be spaced at greater intervals, but the interval shall not exceed four feet;

(B) the contour equivalent to the elevation of the lowest uncontrolled spillway inlet, not including any low-flow augmentation works;

(C) the contour equivalent to the maximum water surface reached during the design storm;

(D) the contour equivalent to the elevation of the top of the dam;

(E) construction ingress and egress routes to the dam and reservoir;

(F) the name and address of each person owning any of the following:

(i) The land on which the dam and its appurtenances, including the auxiliary spillway or service spillway, down to the location where the spillway discharges back to the receiving stream, will be constructed;

(ii) ingress and egress routes to the dam and reservoir;

(iii) the reservoir site up to the top of the dam elevation; and

(iv) the borrow areas if they are located outside the reservoir site;

(G) if the reservoir area is divided between more than one landowner, the property lines, which shall be shown on the topographic map of the reservoir;

(H) roads, railroads, pipeline crossings, and any other prominent features in the vicinity;

(I) the boundary line for each easement; and

(J) the limits of each borrow area;

(d) the cross-section view of the valley at the dam site, which shall be shown along the centerline of the dam with the same stationing as that used on the plan view. The following shall be shown:

(1) The elevation to which the top of the dam is to be maintained and the elevation to which the dam is to be initially constructed in order to provide an adequate settlement allowance;

(2) the location and elevation of the auxiliary spillway or service spillway at the centerline of the dam;

(3) the original surface of the ground, including the streambed, up to the elevation of the top of the dam;

(4) the proposed elevations of the bottom of the cutoff trench; and

(5) the location of all test holes and the materials encountered in the test holes;

(e) a cross-section view perpendicular to the centerline of the dam at the lowest point on the downstream toe extending to the limits of the fill being placed. If the cross section is variable, a typical section shall be shown for each reach of similar cross section with a proper description of the reach by stationing. Additional typical cross sections along the centerline of the primary spillway and the centerline of any other outlets shall be shown. Cross sections of the dam shall include the following:

(1) The elevations of the shoulders and centerline of the dam and the width of the top of the dam;

(2) the elevation of the top of any berm, the elevation of the outside shoulder of any berm, and the top width of any berm;

(3) the slopes of upstream and downstream faces of the dam;

(4) the elevation, location, and type of slope protection;

(5) the zones of the embankment;

(6) the dimensions to which the dam is to be constructed to provide an adequate allowance for settlement;

(7) the elevation, location, and dimensions of the planned cutoff trench; and

(8) the elevation of the downstream toe of the dam at its lowest point;

(f) the following information concerning each open-channel spillway:

(1) A plan view showing the location and sta-

tioning along the centerline of the spillway, together with the location of the control section;

(2) cross sections showing side slopes and dimensions of the spillway, and the original surface of the ground up to the point where the spillway sides intersect the original ground surface;

(3) a profile along the centerline of the spillway, extending from the point upstream where the profile of the spillway intersects natural ground through the control section to the streambed below the dam. The stationing on the profile shall correspond to that on the plan view. The station and elevation of the breaks in the grade of the spillway shall be shown. This profile shall show the existing ground elevation, proposed grade of the bottom of the spillway, elevation of slope protection on the side slopes, and geologic logs of the borings required in the auxiliary spillway or service spillway by K.A.R. 5-40-40, superimposed on the profile through which the spillway is excavated; and

(4) the data necessary to stake out any curves;

(g) the following information concerning the primary spillway:

(1) The profile along the centerline of the spillway, extending from the intake to the outlet, showing the size, dimensions, and locations of seepage control features. This profile shall show existing ground elevations and the proposed grade of the spillway;

(2) the plan, profile, and cross-section views of the stilling basin, primary spillway supports, and other features;

(3) the geologic logs of the borings done in the vicinity of the primary spillway shall be superimposed on the profile;

(4) the location and type of all bedding materials;

(5) a table of pipe grades for all concrete pipes; and

(6) conduit joint details;

(h) the number of acres enclosed by each contour within the reservoir area and the total storage capacity of the reservoir in acre-feet at the elevation of each contour, which shall be determined and tabulated on the plan. The data shall be compiled for all contours in the reservoir up to the elevation of the top of the dam. Computations of capacity shall be based on the natural topography of the reservoir basin but may include the volume of any excavation in the reservoir made during construction of the dam;

(i) a curve or table showing the discharge capacities, in cubic feet per second, of all spillways through a range of surface water elevations from the lowest spillway inlet elevation to the top of the dam elevation, which shall be developed and shown on the plans or in the design report;

(j) the following information, which shall be shown on the plans in plan view, profile, and cross section:

(1) Drain details, including foundation drains;

(2) permanent erosion control protection, including riprap; and

(3) details of stilling basins, outlets, and other appurtenant structures; and

(k) the following information, which shall be shown on either the plans or the specifications:

(1) A table of gradation for each drain; and

(2) a table of gradation of the bedding of the riprap. (Authorized by K.S.A. 2006 Supp. 82a-303a; implementing K.S.A. 2006 Supp. 82a-302 and 82a-303a; effective May 1, 1983; amended May 1, 1985; amended May 1, 1987; amended May 18, 2007.)

5-40-2a. Benchmarks. (a) At least two permanent benchmarks shall be installed for future reference at each dam. Each benchmark shall be located according to the following criteria:

(1) In an area where the benchmark will not be disturbed, destroyed, or inundated after the dam is complete; and

(2) along the centerline of the dam on either end of the dam, if practical, and in undisturbed soil.

(b) On high-impact dams, each permanent benchmark shall also meet the following criteria:

(1) Be installed in a hole that meets the following criteria:

(A) Is 12 inches in diameter; and

(B) is at least 42 inches deep or is drilled to bedrock, whichever is less;

(2) be constructed of one or more steel reinforcing bars at least ⅜ inch in diameter and 36 inches in length or the length of the depth of the hole, whichever is less. The reinforcing bar or bars shall be placed in the hole and the hole backfilled with concrete rounded off flush with the ground;

(3) be capped by a metal survey marker; and

(4) be either marked by a witness post or survey marker sign or tied to at least two objects in the vicinity by distance and bearing.

(c) On low-impact dams, each permanent benchmark shall also meet the following minimum requirements:

(1) Be constructed of a reinforcing bar that is 36 inches long, one-half inch in diameter, and driven flush with the surface of the ground;

(2) be installed at a location protected from grazing animals and vehicular traffic; and

(3) be either marked by a witness post or survey marker sign or tied to at least two objects in the vicinity by distance and bearing.

(d)(1) The elevation and horizontal location of each permanent benchmark shall be shown on the as-built drawings or the construction inspection report. The location of each permanent benchmark shall be described in reference to centerline stationing and offset from the centerline. The elevation of each permanent benchmark for all of the following classes of dams shall be referenced to the national geodetic vertical datum of 1988, or other acceptable national vertical datum, to a tolerance of plus or minus 0.5 foot:

(A) Class size two, hazard classes B and C;

(B) class size three dams; and

(C) class size four dams.

(2) The elevation of each benchmark for class sizes one and two, hazard class A dams may be referenced to an assumed datum.

(e) Horizontal control shall be referenced to the Kansas state plane coordinate system as set forth in K.S.A. 58-20a01 et seq., and amendments thereto. The location of each benchmark shall be shown on the as-built drawings or the notice of completion by using either of the following:

(1) The plane coordinate values consisting of a northing and an easting from the appropriate monumented point according to K.S.A. 58-20a03, and amendments thereto; or

(2) the feet distances north or south, and east or west, from the nearest or most convenient section corner. (Authorized by K.S.A. 2006 Supp. 82a-303a; implementing K.S.A. 2006 Supp. 82a-302 and 82a-303a; effective May 18, 2007.)

5-40-2b. Design reports. (a) The application for each permit to construct, repair, or modify a dam shall be accompanied by a design report prepared by the engineer who designed the new dam or the repair or modification of an existing dam. The design report shall document every major design element of the dam, the conditions that must be addressed in the construction of the project, and the manner in which those conditions will be addressed. The design report shall document the design process, including references to each design method and computer program utilized in the design, and shall include the following:

(1) The design of any slope protection for the embankment and the auxiliary or service spillway. If no slope protection is provided, the report shall provide justification for not having slope protection;

(2) documentation of the determination of the hazard class;

(3) a report of the geotechnical investigation, including the results of the testing required in K.A.R. 5-40-40 through K.A.R. 5-40-42, and all boring logs not shown on the plans;

(4) documentation of the embankment design based upon the geotechnical investigation;

(5) documentation of the hydrological evaluation, including the determination of the composite curve number and drainage area;

(6) if a proposed dam is part of a general plan, the report shall evaluate whether the proposed dam conforms to the general plan;

(7) the design of the foundations, including the proposed depth of the cutoff trench;

(8) the design of the drains, including size, material gradation, interface with soil, and outlets;

(9) the design of the pipe bedding, including documentation that the loading and deflection conditions are met;

(10) the stilling basin design;

(11) documentation of the flood routing or routings;

(12) the gradation of the material in the diaphragm and the design of the diaphragm; and

(13) any other relevant information required by the chief engineer.

(b) In addition to those items required in subsection (a), the design report for each high-impact dam shall include the following:

(1) The auxiliary spillway or service spillway analysis required by K.A.R. 5-40-56(c), if applicable, or K.A.R. 5-40-57(a);

(2) a slope stability analysis; and

(3) an embankment settlement analysis. (Authorized by K.S.A. 2006 Supp. 82a-303a; implementing K.S.A. 2006 Supp. 82a-302 and 82a-303a; effective May 18, 2007.)

5-40-3. Specifications. (a) Each applicant shall submit specifications with the application for a permit to construct a dam. The specifications shall address every major element in the construction of the dam and the materials used to construct the dam. The specifications shall be clear,

legible, and sufficiently detailed to ensure that the dam and appurtenant works will be properly constructed and shall meet the requirements of sound engineering principles and commonly accepted engineering practices. The specifications shall state the minimum quality of materials and workmanship that is acceptable and the required materials tests and testing frequency. The specifications shall cover the following:

(1) The excavation procedures;

(2) the placement and compaction of earthen fill;

(3) the dewatering process;

(4) concrete and reinforcing steel requirements and placement;

(5) the materials for and placement of all conduits;

(6) the materials for and placement of permanent erosion control measures;

(7) drains and seepage control, including aggregate requirements; and

(8) seeding and fencing.

The specifications shall also include an index. The specifications may be submitted electronically in a form and manner prescribed by the chief engineer.

(b) A copy of the plans and specifications that have been approved by the chief engineer shall be accessible at the construction site at all times during construction. (Authorized by K.S.A. 2006 Supp. 82a-303a; implementing K.S.A. 2006 Supp. 82a-302 and 82a-303a; effective May 1, 1983; amended May 1, 1987; amended May 18, 2007.)

5-40-4. Preparer of maps, plans, profiles, reports, and specifications. In addition to the requirements of the Kansas state board of technical professions, the requirements in this regulation shall apply. (a) Each map, plan, profile, report, and specification submitted to the chief engineer for approval shall be prepared by, or under the supervision of, a person who is competent in the design and construction of channel changes or stream obstructions, as appropriate.

(b) Maps, plans, profiles, reports, and specifications for any dam shall be prepared by, or under the supervision of, a licensed professional engineer who is competent in the design and construction of dams.

(c) Maps, plans, profiles, reports, and specifications for any channel change or stream obstruction project on a navigable stream or a stream having a mean annual flow of 100 cubic feet per second or more at the proposed location of the project shall be prepared by a licensed professional engineer who is competent in the design of that type of project.

(d) No provision of this regulation, and no decision made by the chief engineer pursuant to this regulation, shall alter the responsibilities or duties of any licensee of the Kansas state board of technical professions to comply with that board's requirements. (Authorized by K.S.A. 2006 Supp. 82a-303a; implementing K.S.A. 2006 Supp. 82a-302 and 82a-303a; effective May 1, 1983; amended May 1, 1986; amended May 1, 1987; amended Sept. 22, 2000; amended May 18, 2007.)

5-40-5. Determining the capacity of a reservoir. (a) The capacity of each proposed reservoir shall be determined as specified in K.A.R. 5-40-2(h).

(b) The capacity of each existing reservoir shall be determined by using the procedure specified in K.A.R. 5-40-2(h) for contours above the water surface. The engineer determining the reservoir capacity shall demonstrate the validity of the method that the engineer selects to extrapolate the data for contours below the water surface. The capacity of an existing reservoir shall not be reduced by including the accumulated sediment. (Authorized by K.S.A. 2006 Supp. 82a-303a; implementing K.S.A. 2006 Supp. 82a-301 and 82a-303a; effective May 1, 1983; amended May 18, 2007.)

5-40-5a. Determining the height of a dam or barrier. To determine the height of a dam or barrier pursuant to K.S.A. 82a-301(b) and amendments thereto, that measurement shall be made as follows: (a) The height of a dam or barrier that extends across the natural bed of a stream or watercourse shall be the vertical distance measured from the bed of the stream or watercourse at the downstream toe of the dam or barrier to the lowest elevation on the top of the dam or barrier, excluding any open-channel spillway and any anomalous low points.

(b) The height of a dam or barrier that does not extend across the natural bed of a stream or watercourse shall be the vertical distance measured from the lowest elevation of the outside limit of the dam or barrier to the lowest elevation on the top of the dam or barrier, excluding any open-channel spillway and any anomalous low points.

(c) The height of a proposed barrier or dam shall be measured from the planned top of the

dam, excluding any allowance for settlement. (Authorized by K.S.A. 2006 Supp. 82a-303a; implementing K.S.A. 2006 Supp. 82a-301 and 82a-303a; effective May 18, 2007.)

5-40-8. Acceptable application. (a) To be acceptable for filing, each application for a permit to construct, modify, or repair a dam, other stream obstruction, or channel change shall be accompanied by the statutorily required filing fee and shall contain all of the following:

(1) One copy of the completed application on a form prescribed by the chief engineer and signed by the applicant;

(2) two copies of the maps, plans, specifications, and profiles for a proposed or existing dam that meet the requirements of these regulations or one copy of the maps, plans, specifications, and profiles for any other stream obstruction or channel change that meet the requirements of these regulations; and

(3) for a proposed or existing dam, one copy of the design report that meets the requirements of these regulations.

(b) If the applicant fails to meet the requirements of subsection (a), the applicant shall be notified by the chief engineer of the deficiencies in writing and given 60 days from the time the notice is postmarked to submit the required items. If the required items are not submitted within 30 days after the chief engineer's notice is postmarked, a reminder letter shall be sent to applicant again requesting the required items.

(c) Any applicant may submit a request for an extension of time to provide a complete application. The applicant shall submit the request for extension of time before the deadline to submit the items. The request shall also include a justification for the extension of time and an estimate of the time needed to submit the required items.

(d) If the required items are not submitted within 60 days after the chief engineer's notification of deficiency, or within any authorized extension of time, the application shall be dismissed and the application fee forfeited.

(e) If the dismissed application was for the construction, repair, or modification of an existing illegal, unpermitted dam, the removal of the dam shall be ordered by the chief engineer.

(f) If an application is dismissed pursuant to this regulation, within 30 days of the date of dismissal the applicant may apply to have the application reinstated. The application may be reinstated by the chief engineer for good cause shown by the applicant. (Authorized by K.S.A. 2006 Supp. 82a-303a; implementing K.S.A. 2006 Supp. 82a-301, 82a-302, and 82a-303a and K.S.A. 82a-303c; effective May 1, 1983; amended May 18, 2007.)

5-40-9. (Authorized by K.S.A. 82a-303a; implementing K.S.A. 82a-302; effective May 1, 1983; amended May 1, 1985; amended May 1, 1986; revoked May 18, 2007.)

5-40-10. (Authorized by K.S.A. 82a-303a; implementing K.S.A. 82a-302; effective May 1, 1984; amended May 1, 1985; amended May 1, 1986; revoked May 18, 2007.)

5-40-11. (Authorized by K.S.A. 82a-303a; implementing K.S.A. 82a-302 and 82a-303; effective Sept. 22, 2000; revoked May 18, 2007.)

5-40-12. As-built drawings. (a) Each permit shall be conditioned by the chief engineer to require as-built drawings for each category listed in subsection (b) to be submitted within 90 days of the completion of the dam, repairs, or modifications, or any extension of time authorized by the chief engineer for good cause. The drawings shall be prepared by a person qualified to prepare the original plans and specifications pursuant to K.A.R. 5-40-4.

(b) As-built drawings shall be submitted for each of the following categories:

(1) All high-impact dams;

(2) any dam, if required by the chief engineer as a condition of the permit to build, repair, or modify the dam; and

(3) any dam, if required by the chief engineer as the result of an approval of a change in the approved plans requested by the applicant during construction.

(c) The as-built drawings shall show all the features of the structure included in the approved plans as those features were constructed. A legibly marked-up copy of the approved plans shall be acceptable as as-built drawings.

(d) A profile of the bottom of the cutoff trench as constructed shall be shown on the as-built drawings. (Authorized by K.S.A. 2006 Supp. 82a-303a; implementing K.S.A. 82a-303 and 82a-303a; effective May 1, 1987; amended May 18, 2007.)

5-40-13. (Authorized by K.S.A. 82a-303a;

implementing K.S.A. 82a-303; effective May 1, 1987; revoked May 18, 2007.)

5-40-20. Hazard classes of dams. (a) The hazard classes of dams shall be determined from the following based on the location of the dam, the hazards found within the inundation area, and the impact of a failure of a dam:

(1) A "hazard class A dam" shall mean a dam located in an area where failure could damage only farm or other uninhabited buildings, agricultural or undeveloped land including hiking trails, or traffic on low-volume roads that meet the requirements for hazard class A dams as specified in subsections (b) and (c).

(2) A "hazard class B dam" shall mean a dam located in an area where failure could endanger a few lives, damage an isolated home, damage traffic on moderate-volume roads that meet the requirements for hazard class B dams as specified in subsections (b) and (c), damage low-volume railroad tracks, interrupt the use or service of a utility serving a small number of customers, or inundate recreation facilities, including campground areas intermittently used for sleeping and serving a relatively small number of persons.

(3) A "hazard class C dam" shall mean a dam located in an area where failure could result in any of the following:

(A) Extensive loss of life;

(B) damage to more than one home;

(C) damage to industrial or commercial facilities;

(D) interruption of a public utility serving a large number of customers;

(E) damage to traffic on high-volume roads that meet the requirements for hazard class C dams as specified in subsections (b) and (c) or a high-volume railroad line;

(F) inundation of a frequently used recreation facility serving a relatively large number of persons; or

(G) two or more individual hazards described in hazard class B.

(b) If there is a road across any part of the embankment or a spillway, including the auxiliary spillway or service spillway channel down to the receiving stream, the daily vehicular traffic shall be considered in determining the hazard classification, in addition to the criteria specified in subsection (a). The hazard classifications specified in this subsection shall be used if these classifications are more stringent than the hazard classifications required by subsection (a).

Hazard class	Vehicles per day
A	0 through 100
B	101 through 500
C	more than 500

(c) If any road in the inundation area does not meet the criteria of subsection (b), the daily vehicular traffic shall be considered in determining the hazard classification, in addition to the criteria specified in subsection (a). The hazard classifications specified in this subsection shall be used if these classifications are more stringent than the hazard classifications otherwise required by subsection (a).

Hazard class	Vehicles per day
A	0 through 500
B	501 through 1,500
C	more than 1,500

(Authorized by K.S.A. 2006 Supp. 82a-303a; implementing K.S.A. 2006 Supp. 82a-303a and 82a-303b; effective May 18, 2007.)

5-40-21. Class sizes of dams. (a) Each dam that the chief engineer has authority to regulate pursuant to K.S.A. 82a-301 et seq., and amendments thereto, with an effective height of less than 25 feet and an effective storage of less than 50 acre-feet shall be considered to be a class size 1 dam. The class size of all other dams shall be determined from the following table:

Class size	Size factor
2	less than 3,000
3	3,000 through 30,000
4	more than 30,000

(b) Each existing permitted dam and each dam for which an application was submitted before the effective date of this regulation shall continue to have the effective height measured from the flow line of the stream at the centerline of the dam. (Authorized by K.S.A. 2006 Supp. 82a-303a; implementing K.S.A. 2006 Supp. 82a-303a and 82a-303b; effective May 18, 2007.)

5-40-22. Design requirements for construction of a dam. Each dam constructed shall meet or exceed the design requirements specified in the table in this regulation. The minimum top of the dam elevation shall be the maximum water surface elevation determined by routing the design storm specified in the following table, using

the methodology specified in K.A.R. 5-40-30 through K.A.R. 5-40-33, through the reservoir and the dam's spillways, plus the minimum freeboard shown in the following table. The minimum floor width of the open-channel spillway shall be the minimum floor width shown in the following table.

Dam size class	Hazard class	Precipitation for design storm	Minimum freeboard in feet	Minimum floor width of open-channel spillway in feet
1	A	2% chance	1	20
	B	0.25 PMP	2	
	C	0.40 PMP	3	
2	A	1% chance	2	30
	B	0.25 PMP	2	
	C	0.40 PMP	3	
3	A	1% chance	3	40
	B	0.30 PMP	3	
	C	0.40 PMP	3	
4	A	0.25 PMP	3	40
	B	0.30 PMP	3	
	C	0.40 PMP	3	

(Authorized by and implementing K.S.A. 2006 Supp. 82a-303a; effective May 18, 2007.)

5-40-23. Detention storage. (a) To determine the minimum required detention storage, the applicant shall show that the computed runoff from the detention storm can be stored in the reservoir and discharged through the primary spillway without any flow being discharged through the auxiliary spillway. The elevation of the auxiliary spillway control section shall be set so that the computed runoff from the detention storm specified in the following table and determined from the procedures in K.A.R. 5-40-30 through K.A.R. 5-40-33 does not result in discharge through the auxiliary spillway.

Hazard class	Size	Purpose	Minimum detention storm
A	1, 2	Flood control	4% chance
A	3	Flood control	4% chance
A	4	Flood control	2% chance
B	All	Flood control	2% chance
C	All	Flood control	2% chance
A	1, 2	All uses other than flood control	50% chance
A	3	All uses other than flood control	50% chance
A	4	All uses other than flood control	20% chance
B	All	All uses other than flood control	20% chance
C	All	All uses other than flood control	20% chance

Each dam that has flood control as a purpose shall meet the detention storm requirements for a flood control structure. A dam that is not constructed for flood control purposes and whose auxiliary spillway meets the requirements for a service spillway in K.A.R. 5-40-57 shall not be required to meet any minimum detention storm requirement in the table in this subsection.

(b) Each dam shall have a primary spillway and an auxiliary spillway, unless a service spillway meeting the requirements of K.A.R. 5-40-57 is provided. (Authorized by and implementing K.S.A. 2006 Supp. 82a-303a; effective May 18, 2007.)

5-40-24. Dam breach analysis. A dam breach analysis shall be conducted on each proposed dam as specified in this regulation. If a dam breach analysis is required for an existing dam, the analysis shall be conducted in the same manner as that specified in this regulation for a proposed dam. (a) To determine the appropriate water surface elevation in the reservoir when the breach begins, the breach analysis shall route the appropriate design duration one percent-chance storm determined by K.A.R. 5-40-31 through the reservoir. The routing shall begin by assuming that the water surface elevation is at the elevation of the lowest uncontrolled spillway inlet, not including any low-flow augmentation works. The antecedent moisture condition (AMC) used to determine the runoff shall be determined according to K.A.R. 5-40-32. The minimum water surface elevation used to begin the breach analysis shall be the greater of the following:

(1) The water surface elevation determined by routing the required design duration one percent-chance storm through the reservoir; or

(2) the elevation of the crest of the auxiliary spillway.

Routing the storm through the reservoir may account for the discharge of the primary spillway and any open-channel spillways. If the dam does not have an open-channel spillway, the water sur-

face elevation used shall be the elevation of the top of the dam or the elevation resulting from using PMP as the runoff event, whichever is lower.

(b) The breach discharge shall be determined by using the peak breach discharge criteria section on pages 1-1 through 1-2 in "earth dams and reservoirs," TR-60, dated July 2005, published by the conservation engineering division of the natural resources conservation service, and hereby adopted by reference, unless the applicant receives written approval of the chief engineer to use a model that is more appropriate for a particular dam. The breach discharge hydrograph shall be determined by methods in NRCS TR-66, third edition, "simplified dam-breach routing procedure," dated September 1985, which is hereby adopted by reference, including the appendices. If another model is used, the following breach modeling assumptions shall be used, unless the applicant demonstrates to the chief engineer that more appropriate assumptions should be used:

(1) The parameters shall support the assumption of a rapidly developing breach that is either an overtopping failure or a spillway failure caused by intense, localized erosion beginning at the downstream end of the auxiliary spillway or service spillway and working its way upstream.

(2) If the breach model has breach width as a variable, the minimum bottom width of the breach shall be twice the height of the dam. If there is a well-defined physical floodplain, the height of the dam may be measured from the top of the low bank of the stream to the top of the dam for the purpose of determining the minimum breach width.

(3) If the side slopes of the breach are a parameter of the model, vertical side slopes shall be used.

(4) If the breach model has breach time as a variable, the maximum breach time shall be one minute per foot of height of the dam.

(c) The breach discharge shall be routed downstream using a hydraulic flow model in accordance with sound engineering principles and commonly accepted engineering practices. An unsteady state hydraulic flow model shall be used if it is necessary to model existing hydraulic structures in the inundation area. In all other instances, a steady state hydraulic flow model may be used.

(d) The inundation area analyzed shall meet both of the following requirements:

(1) Be from the downstream toe of the dam and the control section of any open-channel section of any open-channel spillway, downstream to the point where the crest of the breach wave intersects the flood level of the peak discharge of the one percent-chance storm, assuming that the dam was not in place; and

(2) be analyzed to the point at which there are no more hazards downstream.

The peak discharge of the one percent-chance storm may be determined by any of the methods provided in K.A.R. 5-42-5 or the appropriate published flood insurance study for the stream receiving the discharge from the breach of the dam.

(e) If there is more than one dam on a stream, it shall be assumed that the most upstream dam is breached first and that the peak flow of that breach arrives at the next downstream dam at the same time the peak water surface elevation from the inflow of the one percent-chance storm from the uncontrolled portion of the lower dam's drainage area occurs. An appropriate model may be used to demonstrate when the peaks will occur for an entire system of dams, in which case the water surface elevation modeled shall be used.

(f) If there are dams on separate tributaries above the dam being analyzed, the modeling assumption specified in subsection (e) shall be applied only to the tributary that has the upstream dam whose breach results in the greatest computed breach discharge at the dam being analyzed.

(g) If digital elevation data is used in the analysis of the breach, the data used shall have a root mean square error of 2.5 meters or less.

(h) Cross sections for modeling purposes shall be taken at appropriate locations, but in no case shall the intervals be less than 2,640 feet measured along the floodplain of the watercourse. Cross sections shall be generally perpendicular to the direction of flow and the contour lines that the cross sections intersect. Cross sections may be broken into several connected segments as needed to meet the requirements of this subsection.

(i) Each bridge and any other hydraulic structure that has a significant hydraulic effect shall be included in the analysis.

(j)(1) The applicant shall submit a contour map of the valley with contour intervals of 10 feet or less and a scale of not less than 1:24,000, which shall show the following:

(A) The inundation area determined from the breach;

(B) the location of each existing hazard; and

(C) each cross section entered in the hydraulic flow model with a label identifying the cross section.

(2) The following items shall be shown on the contour map or on separate documentation:

(A) The elevation of each existing hazard;

(B) the water surface elevation at each existing hazard;

(C) the elevation of the streambed at the point nearest each existing hazard; and

(D) a tabular report including the following information for each cross section:

(i) The label identifying each cross section shown on the map;

(ii) the elevation of the maximum water surface attained during the breach;

(iii) the peak discharge; and

(iv) the computed width of the water surface.

(3) If there are more than 10 hazards in any 2,640-foot reach in the flood inundation area, the information required in paragraph (j)(2) may be noted only for the hazard in that reach that is closest to the maximum water surface elevation measured vertically and the hazard in that reach that is farthest from the maximum water surface elevation measured vertically.

(k) The applicant shall submit one copy of each data file used to perform each analysis in electronic form along with identification of the computer programs used to perform the analysis and any model documentation needed for the chief engineer to review the analysis. (Authorized by K.S.A. 2006 Supp. 82a-303a; implementing K.S.A. 2006 Supp. 82a-302 and 82a-303a; effective May 18, 2007.)

5-40-26. Request to issue or reconsider hazard class determination. (a)(1) If an owner or applicant does not agree with the hazard classification determined for a dam, the owner or applicant may file a request for reconsideration of the hazard class determination.

(2) Each request for reconsideration shall be submitted in writing and shall indicate the following:

(A) The owner's or applicant's proposed hazard classification;

(B) the basis of that proposal; and

(C) an explanation of why the owner or applicant believes that the determination of the hazard classification by the chief engineer is incorrect. The request shall also contain documentation and analysis that support the request.

(3) Each request for reconsideration shall be filed with the chief engineer within 15 days after the owner or applicant is served with written notice of the hazard classification by the office of the chief engineer or within any extension of time authorized by the chief engineer in writing.

(b) Each request for reconsideration shall be reviewed by the chief engineer, and a final written determination of the hazard classification shall be made by the chief engineer.

(c) If the chief engineer has not issued a written notice of the hazard classification, the owner or applicant may request a written notice after the owner or applicant has been informed verbally of the proposed hazard classification by the chief engineer. (Authorized by K.S.A. 2006 Supp. 82a-303a; implementing K.S.A. 2006 Supp. 82a-303a and 82a-303b; effective May 18, 2007.)

5-40-30. Time of concentration. (a) Except as specified in subsections (b) and (c), the time of concentration (T_c) shall be determined by using one of the methods specified in chapter 15, "travel time, time of concentration and lag," in the natural resources conservation service (NRCS) national engineering handbook, part 630, dated August 1972, which is hereby adopted by reference.

(b) For drainage areas of not more than three square miles, the time of concentration (T_c) may be determined by use of the Kirpich formula, which is as follows:

$$T_c = \left(\frac{11.9L^3}{H} \right)^{0.385}$$

Where

T_c = the time of concentration, in hours

L = the longest distance that water has to travel in the drainage basin, in miles

H = the maximum elevation difference in the drainage basin, in feet.

(c) In addition to the methods specified in subsections (a) and (b), the applicant may determine T_c based on sound engineering principles and commonly accepted engineering practices if the applicant obtains the prior written consent of the chief engineer. (Authorized by and implementing K.S.A. 2006 Supp. 82a-303a; effective May 18, 2007.)

5-40-31. Design duration rainfall depth. (a) If the time of concentration is six hours or less, a duration of six hours shall be used for all design

storms. The appropriate six-hour storm depth, in inches, shall be selected from the following table.

County	Probability of occurrence in any year					
	50%	**20%**	**4%**	**2%**	**1%**	**PMP**
Allen	2.7	3.5	4.8	5.4	6.1	28.0
Anderson	2.7	3.5	4.8	5.3	6.0	27.8
Atchison	2.6	3.4	4.5	5.1	5.7	27.2
Barber	2.4	3.2	4.4	5.0	5.7	27.3
Barton	2.3	3.0	4.1	4.8	5.3	26.6
Bourbon	2.7	3.5	4.8	5.4	6.0	28.1
Brown	2.5	3.2	4.4	5.0	5.6	27.0
Butler	2.6	3.4	4.7	5.3	6.0	27.7
Chase	2.6	3.4	4.6	5.2	5.9	27.5
Chautauqua	2.7	3.5	4.9	5.5	6.2	28.3
Cherokee	2.8	3.6	5.0	5.5	6.2	28.5
Cheyenne	1.8	2.4	3.4	3.8	4.3	24.7
Clark	2.2	3.0	4.1	4.7	5.3	26.7
Clay	2.5	3.2	4.3	5.0	5.5	26.8
Cloud	2.4	3.1	4.2	4.8	5.4	26.6
Coffey	2.7	3.5	4.7	5.3	6.0	27.8
Comanche	2.3	3.1	4.2	4.9	5.5	27.0
Cowley	2.6	3.4	4.8	5.4	6.1	28.0
Crawford	2.8	3.6	4.9	5.4	6.1	28.3
Decatur	1.9	2.6	3.6	4.2	4.6	25.3
Dickinson	2.5	3.2	4.4	5.1	5.6	27.1
Doniphan	2.5	3.2	4.5	5.0	5.6	27.0
Douglas	2.6	3.4	4.6	5.2	5.8	27.5
Edwards	2.2	2.9	4.1	4.7	5.3	26.7
Elk	2.7	3.5	4.8	5.4	6.1	28.1
Ellis	2.1	2.9	3.9	4.6	5.0	26.2
Ellsworth	2.3	3.1	4.2	4.9	5.4	26.7
Finney	2.0	2.6	3.8	4.3	4.8	26.8
Ford	2.1	2.8	4.0	4.6	5.1	26.4
Franklin	2.7	3.5	4.7	5.2	5.9	25.8
Geary	2.5	3.2	4.4	5.1	5.7	27.1
Gove	2.0	2.6	3.7	4.3	4.7	25.7
Graham	2.0	2.7	3.8	4.4	4.8	25.8
Grant	1.9	2.6	3.7	4.2	4.7	25.6
Gray	2.0	2.7	3.9	4.4	4.9	26.1
Greeley	1.8	2.5	3.4	3.9	4.4	25.0
Greenwood	2.7	3.5	4.8	5.3	6.1	27.8
Hamilton	1.8	2.5	3.5	4.0	4.5	25.2
Harper	2.5	3.3	4.5	5.2	5.9	27.5
Harvey	2.5	3.3	4.5	5.1	5.8	27.4
Haskell	2.0	2.7	3.8	4.3	4.8	25.9
Hodgeman	2.1	2.8	3.9	4.5	5.0	26.3
Jackson	2.6	3.4	4.5	5.1	5.7	27.2
Jefferson	2.6	3.4	4.6	5.1	5.8	27.3
Jewell	2.3	2.9	4.0	4.7	5.1	26.3
Johnson	2.6	3.4	4.6	5.2	5.8	27.5
Kearny	1.9	2.6	3.6	4.1	4.6	25.5
Kingman	2.4	3.2	4.4	5.1	5.7	27.3
Kiowa	2.2	2.9	4.2	4.8	5.4	26.7
Labette	2.8	3.6	5.0	5.5	6.2	28.4
Lane	2.0	2.7	3.7	4.3	4.8	25.8
Leavenworth	2.6	3.4	4.6	5.1	5.8	27.4
Lincoln	2.3	3.0	4.2	4.8	5.3	26.6
Linn	2.7	3.5	4.8	5.3	6.0	27.9
Logan	1.9	2.5	3.6	4.1	4.6	25.3
Lyon	2.6	3.4	4.6	5.2	6.0	27.5
Marion	2.5	3.3	4.5	5.2	5.8	27.3
Marshall	2.5	3.2	4.3	4.9	5.5	26.8
McPherson	2.5	3.2	4.4	5.1	5.7	27.1
Meade	2.1	2.8	4.0	4.6	5.1	26.3
Miami	2.7	3.5	4.7	5.2	5.9	27.7
Mitchell	2.3	3.0	4.1	4.7	5.2	26.4
Montgomery	2.8	3.5	5.0	5.5	6.2	28.3
Morris	2.6	3.4	4.5	5.1	5.8	27.3
Morton	1.9	2.5	3.6	4.1	4.6	25.4
Nemaha	2.5	3.2	4.4	5.0	5.6	26.9
Neosho	2.7	3.5	4.9	5.5	6.1	28.2
Ness	2.1	2.8	3.9	4.5	4.9	26.1
Norton	2.0	2.6	3.7	4.3	4.7	25.6
Osage	2.6	3.4	4.6	5.2	5.9	27.5
Osborne	2.2	2.9	4.0	4.6	5.1	26.2
Ottawa	2.4	3.1	4.3	4.9	5.4	26.8
Pawnee	2.2	2.9	4.1	4.7	5.2	26.6
Phillips	2.1	2.8	3.8	4.4	4.9	25.8
Pottawatomie	2.5	3.2	4.4	5.0	5.6	27.0
Pratt	2.3	3.1	4.3	4.9	5.5	27.0
Rawlins	1.9	2.5	3.5	4.0	4.5	25.0
Reno	2.4	3.2	4.4	5.0	5.7	27.2
Republic	2.3	3.0	4.1	4.8	5.3	26.4
Rice	2.4	3.1	4.3	4.9	5.5	26.9
Riley	2.5	3.2	4.4	5.0	5.6	27.0
Rooks	2.1	2.8	3.9	4.5	4.9	26.0
Rush	2.2	2.9	4.0	4.6	5.1	26.4
Russell	2.2	2.9	4.1	4.7	5.2	26.5
Saline	2.4	3.1	4.3	5.0	5.5	26.9
Scott	1.9	2.6	3.6	4.2	4.7	25.5
Sedgwick	2.5	3.3	4.6	5.2	5.9	27.5
Seward	2.0	2.7	3.8	4.4	4.9	26.0
Shawnee	2.6	3.4	4.6	5.1	5.8	27.4
Sheridan	2.0	2.6	3.7	4.2	4.7	25.5
Sherman	1.8	2.4	3.4	3.9	4.4	24.8
Smith	2.2	2.9	3.9	4.6	5.0	26.1
Stafford	2.3	3.0	4.2	4.9	5.4	26.9
Stanton	1.9	2.5	3.6	4.1	4.5	25.3
Stevens	1.9	2.6	3.7	4.3	4.7	25.8
Sumner	2.6	3.4	4.7	5.3	6.0	27.8

County	Probability of occurrence in any year					
	50%	20%	4%	2%	1%	PMP
Thomas	1.9	2.5	3.5	4.1	4.5	25.2
Trego	2.0	2.7	3.8	4.4	4.9	25.9
Wabaunsee	2.6	3.4	4.5	5.1	5.8	27.3
Wallace	1.8	2.4	3.4	3.9	4.4	24.9
Washington	2.4	3.1	4.2	4.9	5.4	26.6
Wichita	1.9	2.5	3.5	4.1	4.5	25.3
Wilson	2.7	3.5	4.9	5.4	6.1	28.1
Woodson	2.7	3.5	4.8	5.4	6.1	28.0
Wyandotte	2.6	3.4	4.6	5.1	5.8	27.4

(b) If the time of concentration of the watershed, or any subwatershed being used to develop the inflow hydrograph, is more than six hours, the ratio for the time equal to or greater than the computed time of concentration shall be selected from the following table. Linear interpolation shall be acceptable. That ratio shall be multiplied by the depth of the six-hour rainfall in the table in subsection (a). The resulting depth is the design duration rainfall depth.

Relative increase in rainfall amount for storm durations over six hours

Time (hours)	100-year ratio	PMP ratio
6	1.000	1.000
6.5	1.019	1.013
7	1.035	1.025
7.5	1.051	1.037
8	1.066	1.048
8.5	1.081	1.058
9	1.094	1.068
9.5	1.108	1.078
10	1.120	1.087
10.5	1.132	1.096
11	1.144	1.104
11.5	1.155	1.112
12	1.166	1.120
13	1.187	1.134
14	1.207	1.148
15	1.225	1.161
16	1.243	1.173
17	1.259	1.185
18	1.275	1.196
20	1.305	1.217
22	1.333	1.236
24	1.359	1.254

(c) If the drainage area exceeds 10 square miles, the rainfall depth obtained from the table in subsection (a) may be reduced by the ratio shown in the table in this subsection. The ratio for the zone in which the dam is located and a drainage area less than or equal to the actual drainage area above the dam shall be selected. The use of linear interpolation shall be acceptable. That ratio shall be multiplied by the depth of rainfall from the table in subsection (a). The result is the design duration rainfall depth. The ratios in subsection (b) and this subsection may be used together, if subsections (b) and (c) both apply.

Drainage area (sq. mi.)	Reduction ratio		
	Zone 1	Zone 2	Zone 3
10	1.00	1.00	1.00
12	0.99	0.99	0.98
15	0.97	0.95	0.93
17	0.96	0.94	0.91
20	0.94	0.91	0.88
22	0.93	0.90	0.86
25	0.92	0.88	0.83
27	0.92	0.87	0.82
30	0.91	0.86	0.80
35	0.90	0.84	0.77
40	0.88	0.82	0.75
45	0.87	0.80	0.72
50	0.86	0.78	0.70
60	0.84	0.75	0.65
70	0.82	0.72	0.62
80	0.80	0.70	0.59
90	0.79	0.68	0.57
100	0.78	0.67	0.55

Zone 1, zone 2, and zone 3 shall have the meanings specified in K.A.R. 5-40-1 under the definition of a "stream." (Authorized by and implementing K.S.A. 2006 Supp. 82a-303a; effective May 18, 2007.)

5-40-32. Determination of rainfall excess. (a) Rainfall excess shall be determined by using the natural resource conservation service (NRCS) runoff curve number method.

(b) The antecedent moisture condition (AMC) to be used when determining the curve number for the design storm shall be one of the following:

(1) For zone one, the curve number determined using AMC III;

(2) for zone two, the curve number determined by averaging the AMC II and AMC III curve numbers; or

(3) for zone three, the curve number determined using AMC II.

Zone one, zone two, and zone three shall have

the meanings specified in K.A.R. 5-40-1 under the definition of a "stream."

(c) If the drainage basin is in two zones, the curve number may be weighted based on the drainage area within each zone.

(d) AMC II shall be used in determining the rainfall-runoff relationship used to compute the required detention storage. (Authorized by and implementing K.S.A. 2006 Supp. 82a-303a; effective May 18, 2007.)

5-40-33. Hydrographs. The rainfall excess determined in K.A.R. 5-40-32 shall be used to determine the time-discharge relationship of inflow to the reservoir for the detention storm and design storm using the techniques described in chapter 16, "hydrographs," in the natural resource conservation service (NRCS) national engineering handbook, part 630, dated March 2007, which is hereby adopted by reference. (Authorized by and implementing K.S.A. 2006 Supp. 82a-303a; effective May 18, 2007.)

5-40-40. Geotechnical investigation of all dams. (a) Each applicant shall ensure that a sufficient geotechnical investigation is performed on the proposed site for each dam to design the dam in accordance with the regulations of the chief engineer and with sound engineering principles and commonly accepted engineering practices. The materials under the proposed dam, open-channel spillway, and borrow area shall be investigated before design and submission of the application for a permit to construct a dam. If unusual or unexpected foundation conditions are encountered in the investigations required in this regulation, additional geotechnical investigation and soil mechanics testing shall be performed as necessary to design and construct the dam in accordance with the regulations of the chief engineer and with sound engineering principles and commonly accepted engineering practices.

(b) The geotechnical investigation specified in these regulations shall be designed by a licensed professional competent in geotechnical investigation and analysis for dams.

(c) The geotechnical information specified in these regulations shall be included in the engineering design report and submitted with the proposed construction plans. The report shall contain a general description of the geotechnical investigation, including the method used for sampling.

(d) The soils sampled in all of the geotechnical investigations shall be classified by using field classification methods and the uniform soil classification system.

(e) The dam design shall make appropriate accommodations for the geology discovered in the investigation.

(f)(1) The foundation of the dam shall be investigated to a depth of not less than one-half the height of the dam at the location of the test hole plus five feet.

(2) If unweathered bedrock is encountered before reaching the sampling depth required in paragraph (f)(1), the sampling shall be done to the unweathered bedrock.

(g) The static water level in each test hole shall be recorded.

(h) A sufficient number of test holes shall be made in each open-channel spillway to determine the stability of the spillway crest and the outlet channel down to the streambed elevation.

(i) A sufficient number of test holes in the borrow area shall be made to determine the amount of suitable material available and to classify the soil to be used in the embankment. (Authorized by and implementing K.S.A. 2006 Supp. 82a-303a; effective May 18, 2007.)

5-40-41. Geotechnical investigation of a low-impact dam. (a) In addition to meeting the requirements of K.A.R. 5-40-40, each low-impact dam shall have a sufficient number of properly placed test holes to be representative of the geology under the proposed dam embankment, with an average of at least one test hole each 200 feet along the centerline of the dam and at least three test holes.

(b) Except as specified in subsection (d) and K.A.R. 5-40-74, each existing unpermitted, illegal dam shall have the same level of geotechnical investigation as that required for a proposed new dam, except that testing the borrow area shall not be required, before a permit will be issued. In addition, the condition of the following shall be determined:

(1) All conduits passing through the embankment;

(2) the embankment in the vicinity of the conduits; and

(3) the rest of the embankment, including any slides, seeps, saturated areas, sloughs, and other visible anomalies in the embankment.

(c) If there are any signs of instability in the embankment, the stability of the slope of the ex-

isting embankment shall be analyzed according to the requirements of K.A.R. 5-40-46(c).

(d) An existing unpermitted, illegal low-hazard dam that is class size 1, 2, or 3, for which a qualified professional has conducted an inspection and submitted to the chief engineer a report of that investigation demonstrating that a geotechnical investigation is not necessary to protect the public safety and property, shall not be required to have the geotechnical investigation required by subsection (b). (Authorized by and implementing K.S.A. 2006 Supp. 82a-303a; effective May 18, 2007.)

5-40-42. Geotechnical investigation of a high-impact dam. (a) In addition to meeting the requirements of K.A.R. 5-40-40, each proposed high-impact dam shall have at least the following number of geotechnical test holes:

(1) A sufficient number of properly placed test holes to be representative of the geology under the proposed dam embankment, with an average of at least one test hole every 100 feet along and as close to the centerline of the dam as practical and a minimum of three test holes; and

(2) a test hole as close as practical to the anticipated location of the following:

(A) The base of the drop inlet; and

(B) the support of the outlet pipe.

(b) At least one representative sample of undisturbed soil shall be tested to determine shear strength parameters, permeability, and compressability.

(c) The geotechnical investigation shall determine the following for at least one representative sample:

(1) Atterberg limits;

(2) the settlement characteristics of the proposed embankment materials and the foundation of the dam;

(3) the Proctor compaction curves of soils;

(4) gradation tests of foundation materials, especially where drain systems could be located; and

(5) any other properties necessary to design a dam to meet the requirements of the regulations of the chief engineer, sound engineering principles, and commonly accepted engineering practices.

(d) Each existing unpermitted, illegal dam shall have the same level of geotechnical investigation as that required for a proposed dam, except that testing the borrow area shall not be required, before a permit may be issued. In addition, the following properties shall be determined:

(1) The condition of all conduits passing through the embankment and the condition of the embankment in the vicinity of the conduits;

(2) the in situ density of the existing embankment and its foundation;

(3) the condition of the embankment, including any slides, seeps, saturated areas, sloughs, and other visible anomalies in the embankment; and

(4) a slope stability analysis of the existing embankment, which shall be performed according to the requirements of K.A.R. 5-40-46. (Authorized by and implementing K.S.A. 2006 Supp. 82a-303a; effective May 18, 2007.)

5-40-43. Cutoff trench. (a) Each dam shall have a cutoff trench. The cutoff trench shall meet all of the following requirements:

(1) Have side slopes no steeper than one horizontal unit to one vertical unit;

(2) have a bottom width of 10 or more feet as necessary to meet the compaction requirements of K.A.R. 5-40-44;

(3) be constructed to the depth justified in the design report based on the findings in the geotechnical report, unless observations by the inspecting engineer during construction justify a different depth;

(4) be backfilled with the most impervious material available at the site. If no impervious material is available at the site, then this material shall be procured off-site;

(5) be backfilled with material that is contiguous to and homogeneous with the most impervious zone within the dam, if the dam is designed as a zoned fill;

(6) be constructed in lifts that shall not exceed nine inches for each lift; and

(7) be constructed of a material that has been brought to acceptable moisture content.

(b) The material placed in the cutoff trench shall be placed according to the same specifications as those required for the embankment in K.A.R. 5-40-44. (Authorized by and implementing K.S.A. 2006 Supp. 82a-303a; effective May 18, 2007.)

5-40-44. Embankment. (a) The minimum top width of an embankment shall be determined from the following table:

Height of dam (in feet)	Minimum top width (in feet)
less than 20	10
20 through 24.9	12
25 through 39.9	14
40 or greater	15

(b) The top of the dam shall be sloped toward the reservoir, unless special measures are taken to adequately control erosion on the downstream side of the dam.

(c) The height of each lift in the embankment and cutoff trench shall be no more than nine inches, unless the dam is designed as a zoned fill. If the dam is designed as a zoned fill, the lifts outside the cutoff trench and most impermeable zone may be larger if geotechnical data is provided that shows that adequate compaction can be achieved using lifts in excess of nine inches.

(d) The material in each low-impact embankment and cutoff trench shall be brought to a moisture content that can be compacted in accordance with this subsection. Each application for a low-impact dam shall contain specifications requiring adequate compaction. The minimum compaction required shall be achieved by one of the following:

(1) Using a sheepsfoot roller until the feet cease to push into the fill material and start to walk across the compacted surface;

(2) using the controlled movement of rubber-tired earth-moving equipment so that every point on the surface of each lift is traversed by not less than one tread track of the equipment; or

(3) using another method that achieves the compaction required by this subsection.

(e) Each high-impact dam shall include the following in its specifications for earth placement in the embankment and cutoff trench:

(1) The minimum and maximum allowable levels of soil moisture;

(2) the compaction standards;

(3) a provision for testing the soils placed during construction; and

(4) a means to ensure that the compaction standards approved by the chief engineer are met during construction.

(f) In addition to the requirements of subsections (d) and (e), the specifications for hand-compacted fill around each conduit in the embankment shall meet the following requirements:

(1) Set a maximum lift of one-third the diameter of the outside of the conduit. However, no lift shall exceed four inches; and

(2) specify a minimum distance around the conduit for hand compaction. (Authorized by and implementing K.S.A. 2006 Supp. 82a-303a; effective May 18, 2007.)

5-40-45. Allowance for settlement of an earthen dam. (a) A detailed soil mechanics investigation report shall be submitted as part of the design report for each high-impact dam. An appropriate allowance for settlement shall be made based on the results in the soil mechanics report.

(b) If a detailed soil mechanics investigation report is not submitted for a low-impact dam, at least five percent of the height of the dam shall be allowed for settlement of the embankment.

(c) An allowance for settlement on each dam may be made by steepening the side slopes during construction and adding to the height of the embankment as needed to increase the height of the dam. (Authorized by and implementing K.S.A. 2006 Supp. 82a-303a; effective May 18, 2007.)

5-40-46. Side slopes of an earthen dam. (a) The side slopes of each earthen dam shall be designed and constructed to be stable and easily maintained.

(b) A slope stability analysis shall be required on each high-impact dam.

(c) If a slope stability analysis is required, the minimum factor of safety shall be based on the steady-state seepage load condition with the water level at the elevation of the lowest open-channel spillway or other uncontrolled spillway with a trash rack that meets the requirements of K.A.R. 5-40-51, as shown in the following table:

Class size	Hazard class	Factor of safety
4	A	1.4
3, 4	B	1.5
1, 2, 3, 4	C	1.5

(d) Each dam whose face is subject to prevailing winds shall be given additional protection from erosion caused by wave action, which may include a flatter side slope, the use of riprap, or the use of grass or vegetation adapted to fluctuating water levels. The design of any slope protection for the embankment and the auxiliary spillway or service spillway shall be shown on the plans. If no slope protection is provided, regardless of the orientation of the dam, the design report shall provide justification for not having slope protection.

(e) The steepest allowable design side slope shall be three horizontal units to one vertical unit on the upstream side of the dam, and two and

one-half horizontal units to one vertical unit on the downstream slope of the dam. (Authorized by and implementing K.S.A. 2006 Supp. 82a-303a; effective May 18, 2007.)

5-40-50. Pipes. (a) Each pipe under or through an embankment shall meet the following requirements:

(1) Be capable of withstanding the external load without buckling, cracking, being damaged, or being deformed. The minimum internal diameter of the pipe shall not be reduced by more than the pipe manufacturer's stated allowable, long-term pipe deflection limit and in no case by more than five percent;

(2) be designed to adequately resist flotation;

(3) be impervious to water, with watertight joints and seams;

(4) except for drawdown pipes, be installed with sufficient slope to provide adequate drainage, with a minimum average slope of one percent after settlement. No pipe shall have an adverse grade through any section of pipe;

(5) if the pipe is installed in conjunction with a riser on a high-impact dam, be placed to insure that the requirements of paragraph (a)(4) are met and that all pipe sections are properly aligned after settlement of the foundation and consolidation of the embankment;

(6) have the discharge end extended a sufficient distance beyond the downstream toe of the dam to avoid erosion to the dam;

(7) be adequately supported at the discharge end to prevent deflection when the pipe is flowing full; and

(8) if the pipe is a primary spillway, be sized to evacuate 95 percent of the detention storage in 14 or fewer days.

(b) Steel cylinder-reinforced concrete pipe shall be acceptable for use in any dam if the design computations, plans, and specifications related to the placement of the pipe meet the minimum requirements of the manufacturer.

(c) In applying the provisions of subsections (c), (e), and (f), the depth of fill over the top of each pipe shall be measured from the top of the embankment after settlement has occurred. Reinforced concrete pipe shall be acceptable for use in a low-impact dam if less than 30 feet of fill will be placed over the pipe and if the design computations, plans, and specifications related to the placement of the pipe meet the minimum requirements of the manufacturer.

(d) Each metal pipe shall be coated with a protective coating adequate to prevent corrosion for the planned life of the dam, or the design report shall include an estimate of the expected life of the pipe, the expected life of the dam, and a plan for replacement of the pipe when it no longer functions as designed.

(e) Corrugated metal pipe shall be acceptable for use in any hazard class A or B dam if no more than 25 feet of fill is placed over the pipe.

(f)(1) Polyvinyl chloride pipe shall be acceptable for use in any dam if the maximum fill over the pipe does not exceed the depth specified in the following table:

Standard dimension ratio (SDR)	Maximum fill over top of pipe (feet)
SDR 17 and thicker	35
SDR 18	31
SDR 21	23
SDR 25	18
SDR 26	16
SDR 28	14

A pipe with walls thinner than SDR 28 shall not be used.

(2) Polyvinyl chloride pipe shall not be placed in high-plasticity soils.

(3) Each portion of polyvinyl chloride pipe that will be exposed to sunlight shall be protected as recommended by the manufacturer of the pipe or shall be encased in a protective material.

(g) Pipe materials other than those described in subsections (b) through (f) may be used if the applicant demonstrates that all of the following criteria are met:

(1) The pipe material, accounting for any protective measures that will be taken, has a minimum expected life of 25 years if exposed to sunlight or buried in soil with the same characteristics of the soil to be used to construct the dam.

(2) All of the pipe manufacturer's design recommendations are met by the plans and specifications for the dam and are documented in the design report.

(3) All of the pipe manufacturer's recommendations for bedding, supporting, and installing the pipe are included in the specifications for construction of the dam, except those specifications that are demonstrated in the design report to be inapplicable in the construction of the proposed dam.

(4) The design report includes an estimate of

the life of the pipe, the life of the dam, and a plan to replace the pipe when it no longer functions as designed if the design life of the pipe is less than that of the dam.

(5) The design report demonstrates that the proposed placement and use of the pipe will meet the requirements of sound engineering principles and commonly accepted engineering practices.

(h) If the estimated life of a pipe is less than the estimated life of the dam, the permit shall contain the condition that the pipe shall be replaced when the pipe no longer functions properly. (Authorized by K.S.A. 2006 Supp. 82a-303a; implementing K.S.A. 2006 Supp. 82a-302 and 82a-303a; effective May 18, 2007.)

5-40-51. Acceptable trash racks for primary spillways. (a) Except as specified in subsection (c), each new or modified primary spillway permitted on or after the effective date of this regulation shall be equipped with an acceptable trash rack, as specified in subsection (b).

(b) "Acceptable trash rack" shall mean a trash rack designed and constructed to prevent debris from clogging the inlet of the primary spillway or the primary spillway conduit. Each acceptable trash rack shall be constructed of material of sufficient strength to withstand the impact of the material that could strike the inlet.

(c)(1) Each primary spillway in a dam permitted before the effective date of this regulation shall be equipped with the acceptable trash rack required by the permit and approval of design. If no trash rack was required by the permit and approval of design, no trash rack shall be required unless the primary spillway fails to function properly.

(2) If the applicant demonstrates that there is not sufficient woody vegetation or other debris in the drainage area to justify the installation of an acceptable trash rack, the requirement to have an acceptable trash rack may be waived.

(d) If a fish screen is installed, the screen shall not impair the functioning of the primary spillway. If a fish screen is proposed, the design report shall demonstrate that the screen is designed in accordance with the standards of subsection (b) and will not impair the functioning of the primary spillway. (Authorized by K.S.A. 2006 Supp. 82a-303a; implementing K.S.A. 2006 Supp. 82a-302 and 82a-303a; effective May 18, 2007.)

5-40-52. Stilling basins. (a) For each new dam, for each primary spillway conduit replacement, and for each existing dam for which the chief engineer determines that it is necessary to protect the integrity of the embankment, each primary spillway conduit with a cross-sectional area in excess of 1.75 square feet shall discharge into one of the following:

(1) A constructed stilling basin below the downstream toe of the dam; or

(2) any other constructed works designed to dissipate energy and prevent erosion.

(b) If a stilling basin is required or constructed, the stilling basin shall be designed to dissipate the energy of the water exiting the conduit so that the stilling basin discharges water to the receiving channel without causing excessive erosion and the stilling basin itself is not damaged by full conduit flow.

(c) The invert of the outlet conduit that discharges into a stilling basin shall be located at least one foot above the tailwater elevation in the stilling basin when water is flowing through the primary spillway at the maximum rate of discharge during the design storm. (Authorized by and implementing K.S.A. 2006 Supp. 82a-303a; effective May 18, 2007.)

5-40-53. Drawdown pipes. (a) Except as specified in subsection (b), each dam shall be equipped with a drawdown pipe that meets the requirements for a pipe as specified in K.A.R. 5-40-50. A valve or gate shall be installed in the pipe so that the controls are accessible and damage from freezing is prevented. Drawdown pipes may be incorporated into the primary spillway.

(b) The installation of a drawdown pipe shall not be required for a low-impact dam if the chief engineer determines that both of the following criteria are met:

(1) The failure to install a drawdown pipe will not prejudicially and unreasonably affect the public interest and the public safety.

(2) The drawdown pipe is not necessary to administer water rights.

(c) Each drawdown pipe shall have the capacity to evacuate 90 percent of the volume of the permanent pool in 14 or fewer days assuming no inflow into the reservoir, but in no case shall the drawdown pipe have an internal diameter of less than four inches. The inlet of the drawdown pipe shall be constructed to reduce the likelihood of plugging. (Authorized by and implementing K.S.A. 2006 Supp. 82a-303a; effective May 18, 2007.)

5-40-54. Control of seepage along a conduit. (a) Each conduit through any portion of a dam below the elevation of the permanent pool shall be constructed to protect the dam from seepage along the conduit by means of cutoff collars or a drainage diaphragm. Cutoff collars may be used only on hazard class A dams that are class sizes one and two.

(b) Each drainage diaphragm shall meet all of the following design criteria:

(1) Be installed so that the largest face is perpendicular to the conduit;

(2) be sized as follows:

(A) If the conduit is circular, the diaphragm shall extend a minimum of two feet or three times the outside diameter of the conduit, whichever is greater, from the outside surface of the conduit horizontally and vertically upward. The diaphragm shall extend vertically downward a minimum of two feet from the outside surface of the conduit;

(B) if the conduit is rectangular, the diaphragm shall extend minimum of two feet or three times the vertical dimension of the conduit, whichever is greater, from the outside surface of the conduit horizontally and vertically upward. The diaphragm shall extend vertically downward a minimum of two feet from the outside surface of the conduit;

(C) a drainage diaphragm shall not be required to penetrate unweathered bedrock; and

(D) the diaphragm shall not be required to extend vertically upward to an elevation higher than the crest of the auxiliary spillway;

(3) have a dimension parallel to the conduit that is at least three feet thick;

(4) except as specified in subsection (d), be located downstream of the centerline of the dam, downstream of the cutoff trench, and far enough upstream of the toe so that there is a minimum of two feet of fill, measured perpendicular to the surface of the embankment, over the top of the diaphragm after settlement of the embankment; and

(5) have an outlet that provides positive drainage of the diaphragm to the stilling basin or other point below the downstream toe of the dam. The flow line of the outlet shall be no lower than one-half foot above the elevation of the outlet of the stilling basin.

(c) Except as specified in subsection (d), each cutoff collar shall meet all of the following design criteria:

(1) Be constructed of the same or similar material as that of the conduit;

(2) be attached to the conduit with a watertight seal;

(3) be of sufficient size and number to increase the length of the seepage path by at least 15 percent;

(4) be spaced at intervals of at least twice the vertical dimension of the largest collar being used;

(5) be located along the conduit in that portion of the dam that will be saturated;

(6) project a minimum of two feet beyond the outside wall of the conduit; and

(7) be located no closer than two feet from any conduit joint.

(d) If cutoff collars or a drainage diaphragm is located in a zoned fill, the location shall be justified in the design report and established in accordance with sound engineering principles and commonly accepted engineering practices.

(e) If another drain included in the design meets the requirements for a diaphragm in subsection (b), that other drain may be considered to be the diaphragm required by subsection (a).

(f) If the applicant desires to use any other type of seepage control, the applicant shall demonstrate to the chief engineer that the proposed type of seepage control protects the dam from seepage along the conduit and meets the requirements of sound engineering principles and commonly accepted engineering practices. (Authorized by K.S.A. 2006 Supp. 82a-303a; implementing K.S.A. 2006 Supp. 82a-302 and 82a-303a; effective May 18, 2007.)

5-40-55. Earthen auxiliary spillways. Each earthen auxiliary spillway shall meet all of the following requirements: (a) If the design discharge from the auxiliary spillway is directed so that the discharge impinges on the downstream toe of the dam, a wing dike shall be designed and constructed to direct spillway flows away from the downstream toe of the dam.

(b) If the auxiliary spillway is located on the embankment of the dam, adequate armor protection, including articulated blocks, concrete paving, gabion baskets underlain with properly designed bedding, or engineered riprap, shall be placed on the portion of the dam where the auxiliary spillway is located.

(c) The side slopes shall be no steeper than three horizontal units to one vertical unit, unless

the spillway is constructed through competent sandstone or limestone.

(d) There shall be at least a 30-foot level section immediately upstream of the control section. Immediately downstream of the control section, the slope of the spillway outlet shall be sufficient to ensure that flows at and above 50 percent of the design storm discharge will flow at a supercritical velocity.

(e) The auxiliary spillway shall be a minimum of three feet deep, as measured from the elevation of the control section to the design top of the dam.

(f) The entrance channel from the reservoir to the level section shall provide a smooth transition that prevents turbulent flow.

(g) The outlet channel shall convey flow to the receiving stream channel with a minimum of erosion.

(h) If a fish screen is installed, the screen shall not impair the functioning of the auxiliary spillway. If a fish screen is proposed, the design report shall demonstrate that the screen will not impair the functioning of the auxiliary spillway. (Authorized by K.S.A. 2006 Supp. 82a-303a; implementing K.S.A. 2006 Supp. 82a-302 and 82a-303a; effective May 18, 2007.)

5-40-56. Maximum design velocity for an auxiliary spillway. (a) The maximum velocity in feet per second during the design storm for water flowing in a vegetated earthen auxiliary spillway shall be determined from the following table:

	Slope of the exit channel			
Vegetation	**Erosion-resistant soils**		**Easily erodible soils**	
	0% to 5%	**5% to 10%**	**0% to 5%**	**5% to 10%**
Bermuda grass and Bahia grass	8	7	6	5
buffalo grass, Kentucky blue grass, smooth brome grass, tall fescue, and reed canary grass	7	6	5	4
sod-forming grass-legume mixtures	5	4	4	3
weeping love grass, yellow bluestem, and native grass mixtures	3.5	3.5	2.5	2.5

(b) The maximum design velocities specified in subsection (a) may be increased by not more than 10 percent if the design frequency of use of the auxiliary spillway is not more than two percent. The maximum design velocities may be increased by not more than 25 percent if the design frequency of use of the auxiliary spillway is not more than one percent.

(c) For exit channel slopes greater than 10 percent, the applicant shall provide analyses showing both of the following:

(1) There is no more than 0.5 foot of erosion depth within 20 feet of the control section for the one-percent chance storm.

(2) The auxiliary spillway does not fail by breaching during the spillway stability design event indicated in the following table:

Hazard class	Size class	Spillway stability design event
A	1, 2, or 3	0.3 PMP
A	4	0.4 PMP
B	1, 2, 3, or 4	0.5 PMP
C	1, 2, 3, or 4	PMP

(d) The provisions of paragraphs (c)(1) and (2) may be used for slopes of 10 percent or less in lieu of the maximum values specified in the table in subsection (a).

(e) The maximum allowable design velocity for water flowing over the following types of materials shall be determined from the following table:

Material	Maximum velocity allowed in feet per second
stratified rock	8.0
sound rock	13.0

(f) Channel lining materials not reliant on vegetation, including concrete, riprap, and grouted riprap, may be used if the applicant demonstrates that the lining will not fail during the spillway stability design event specified in paragraph (c)(2). (Authorized by K.S.A. 2006 Supp. 82a-303a; implementing K.S.A. 2006 Supp. 82a-302 and 82a-303a; effective May 18, 2007.)

5-40-57. Service spillway design. (a) If a dam will have a service spillway, the spillway shall be designed and constructed with a lining material that meets the following requirements:

(1) Covers the channel floor and walls up to the

depth of flow required to bypass the flows of the storm specified as the detention requirement in K.A.R. 5-40-23(a), at a minimum; and

(2) will not fail during the spillway stability design event specified in K.A.R. 5-40-56(c)(2).

(b) Each design report required by K.A.R. 5-40-2b shall include all hydraulic, structural, and geotechnical design information necessary to show that the criteria in subsection (a) are met.

(c) If a fish screen is installed, the screen shall not impair the functioning of the service spillway. If a fish screen is proposed, the design report shall demonstrate that the screen will not impair the functioning of the service spillway. (Authorized by K.S.A. 2006 Supp. 82a-303a; implementing K.S.A. 2006 Supp. 82a-302 and 82a-303a; effective May 18, 2007.)

5-40-70. Construction notification to the chief engineer. Each holder of a permit to construct, or an approval to repair or modify a dam, shall notify the chief engineer at least 48 hours before any of the following stages of construction and shall obtain the approval of the chief engineer before proceeding with each of these stages of construction: (a) Starting construction;

(b) placing backfill in the cutoff trench;

(c) placing backfill around the primary spillway conduit or any other conduit that extends through the dam embankment and exits the downstream slope; and

(d) starting any stage of construction not specified in this regulation for which the permit requires that the chief engineer shall be notified. (Authorized by K.S.A. 2006 Supp. 82a-303a; implementing K.S.A. 2006 Supp. 82a-301a and 82a-303a; effective May 18, 2007.)

5-40-71. Inspection during dam construction, repair, and modification. (a) Except as specified in subsection (d), each high-impact dam shall be inspected by an engineer competent in the design of dams, or that engineer's authorized representative, at all times during any construction activity.

(b) Each low-impact dam shall be inspected by an engineer qualified in the design of dams, or that engineer's authorized representative, whenever any of the following conditions is met:

(1) Backfill is being placed in the cutoff trench of a dam.

(2) Conduits and their appurtenances are being placed.

(3) Backfill is being placed around a conduit.

(4) Drain material and outlets are being installed.

(5) Concrete forms and reinforcing steel are being placed.

(6) Concrete is being placed.

(7) Any other stage of construction required by the permit, approved plans, or approved specifications to be inspected occurs.

(c) Before the start of construction, the permit holder shall provide the chief engineer in writing with the name, address, and telephone number of the engineer responsible for the inspection.

(d) The inspecting engineer, or the engineer's authorized representative, shall not be required to be present during any of the following construction activities for a high-impact dam:

(1) The clearing and grubbing of the construction site;

(2) the removal of structures from the reservoir area other than the removal of a dam;

(3) the installation of pollution-control measures, unless required by other authorities;

(4) seeding;

(5) mulching; and

(6) the construction of a fence.

(e) If the inspecting engineer, or the engineer's authorized representative, observes construction activity that is not in compliance with the approved permit, plans, or specifications and the contractor fails to correct the item or items that are not in compliance with the approved permit, plans, or specifications after being notified by the inspector, the inspector shall notify the chief engineer of the noncompliant activity. (Authorized by K.S.A. 2006 Supp. 82a-303a; implementing K.S.A. 2006 Supp. 82a-301a and 82a-303a; effective May 18, 2007.)

5-40-72. Construction inspection reports. The engineer responsible for the inspection required by K.A.R. 5-40-71 shall, within 30 days of the completion of the construction, repair, or modification of the dam and its appurtenances, submit to the chief engineer an inspection report containing the following items: (a) A notice of completion showing the date on which construction, repair, or modification of the dam and its appurtenances was completed;

(b) a statement indicating one of the following:

(1) The dam and its appurtenances were constructed, repaired, or modified substantially in accordance with the permit and the approved plans and specifications; or

(2) the completed work varied from the permit and the approved plans and specifications. A description of each variation shall be provided;

(c) a final survey of the completed dam and its appurtenances, including the following:

(1) A profile of the top of the dam;

(2) a profile of the centerline of the auxiliary spillway or service spillway;

(3) a cross section at the control section of the auxiliary spillway or service spillway;

(4) a cross section of the dam at its deepest point;

(5) a cross section of the dam at the primary spillway if that section is not near the deepest section of the dam;

(6) the locations and elevations of the inlet and the outlet of the primary spillway;

(7) the location and elevation of each drain outlet; and

(8) the final elevation and coordinates of each permanent benchmark; and

(d) a summary or a copy of the daily inspection logs if required by the permit. (Authorized by K.S.A. 2006 Supp. 82a-303a; implementing K.S.A. 2006 Supp. 82a-301a and 82a-303a; effective May 18, 2007.)

5-40-73. Emergency action plan. (a) The owner of each hazard class B dam shall create an emergency action plan (EAP) on a form prescribed by the chief engineer. The owner shall keep the original EAP and submit a copy of the EAP to the chief engineer. The EAP shall address each of the following:

(1) A description of the dam, including the location of the dam and the access roads;

(2) the name, address, and telephone number of the person responsible for notifying local authorities of an emergency;

(3) a map or written description of the area that could be inundated by the type of breach described in K.A.R. 5-40-24;

(4) a list of persons who should be notified in case of an emergency, including the telephone numbers of those persons and their responsibilities; and

(5) the names, addresses, and telephone numbers of each owner of the dam and its appurtenances and those persons responsible for the operation and maintenance of the dam.

(b) Except as specified in subsection (d), the owner of a hazard class C dam shall create and maintain an emergency action plan that meets the recommendations of the "federal guidelines for dam safety: emergency action planning for dam owners," prepared by the interagency committee on dam safety and published by the federal emergency management agency, dated October 1998 and reprinted January 2004, which is hereby adopted by reference. The owner shall submit a copy of the EAP to the chief engineer.

(c) The owner of any dam for which an EAP is required under these regulations shall annually review the EAP to determine if it is still accurate and applicable to the current condition of the dam and current downstream conditions, including the following:

(1) The contact names and related information;

(2) the breach inundation map or a description of the inundation area; and

(3) emergency procedures.

If any material changes are made when updating the EAP, a copy of the revised EAP shall be submitted to the chief engineer.

(d) Any owner of a hazard class C dam may request that the chief engineer allow the owner to submit an EAP that meets only the requirements of subsection (a) in lieu of meeting the requirements of subsection (b). To make this request, the owner shall submit written justification of why an EAP meeting the requirements of subsection (a) is sufficient to protect the public safety. If the chief engineer approves the request, the chief engineer shall reserve the right to later impose the requirements of subsection (b) if downstream conditions change, the condition of the dam deteriorates, or the EAP does not adequately protect the public safety.

(e) The owner of a hazard class B dam shall submit the required EAP within 180 days of written notification by the chief engineer of the requirement.

(f) The owner of a hazard class C dam shall submit the required EAP within 180 days of written notification by the chief engineer that an EAP is required and that an adequate EAP is not on file in the chief engineer's office. (Authorized by and implementing K.S.A. 2006 Supp. 82a-303a; effective May 18, 2007.)

5-40-73a. Discovery of an existing illegal, unpermitted dam. (a) Except when it is necessary to take additional actions to protect the public safety, when the chief engineer becomes aware of an existing illegal, unpermitted dam, the

following actions shall be taken by the chief engineer:

(1) Determine the hazard classification and condition of the dam;

(2) notify the owner of the dam of the following, in writing:

(A) The fact that the dam is illegal and unpermitted;

(B) the hazard classification of the dam;

(C) the fact that if the owner desires to keep the dam in existence, the owner shall submit a complete application for a permit for the dam pursuant to K.S.A. 82a-301 and K.S.A. 82a-302, and amendments thereto, within 120 days of the date of the chief engineer's notification;

(D) the condition that the application to obtain a permit for the dam shall meet the requirements of K.A.R. 5-40-8 and K.A.R. 5-40-74;

(E) the fact that failure to apply for a permit within 120 days shall result in the issuance of an order by the chief engineer requiring the owner to submit plans to breach or completely remove the dam; and

(F) the fact that the dam is subject to the provisions of this regulation.

(b)(1) If the owner submits an application for a permit within the time specified in paragraph (a)(2)(C), or within any extension of time authorized by the chief engineer in writing, the application shall meet the requirements of K.A.R. 5-40-8 and K.A.R. 5-40-74.

(2) If the owner fails to submit an application for a permit within the time specified in paragraph (a)(2)(C), or within any extension of time authorized by the chief engineer, an order requiring the owner to perform the following shall be issued by the chief engineer:

(A) Submit plans to breach or completely remove the dam; and

(B) bypass inflows and release water from storage so that no more than 15 acre-feet of water is kept in storage in the reservoir while the application for a permit to breach or completely remove the dam is being processed. The application for a permit shall contain all of the information required by K.A.R. 5-40-8 and any other information necessary to properly and safely design and complete the breach or removal. The application shall be submitted within 120 days of the date of the order, or within any extension of time authorized by the chief engineer. The owner shall be required to complete the breach or removal as permitted by the chief engineer within one year of the approval of a permit by the chief engineer, or any extension of time authorized by the chief engineer in writing.

(c) If the chief engineer dismisses an application for an existing illegal, unpermitted dam for any reason, the dismissal of the application shall be accompanied with an order requiring the dam to be breached or removed as provided in paragraph (b)(2).

(d) The order described in paragraph (b)(2) shall be filed by the chief engineer with the register of deeds for the county in which the dam is located.

(e) Each existing illegal, unpermitted dam of which the chief engineer becomes aware, either before or after the adoption of this regulation, shall be subject to this regulation. (Authorized by K.S.A. 2006 Supp. 82a-303a; implementing K.S.A. 2006 Supp. 82a-301, 82a-302, and 82a-303a; effective May 18, 2007.)

5-40-74. Design criteria for an existing illegal, unpermitted dam. (a) Except as specified in subsection (b), the design criteria specified in this subsection (a) shall be met to obtain a permit from the chief engineer pursuant to K.S.A. 82a-301 et seq., and amendments thereto, for an existing illegal, unpermitted hazard class A dam constructed before May 1, 1984 that has not been modified on or after May 1, 1984. The applicant shall have an engineer who is qualified in dam design and construction conduct an inspection of the dam and prepare a report that includes all of the following:

(1) The date of the inspection and a list of the members of the inspection team;

(2) color photographs documenting the condition of the dam's appurtenances and embankment and any observed deficiencies in the appurtenances and embankment;

(3) a plan view sketch of the dam and its immediate vicinity showing the location from which each photograph was taken and the direction in which it was taken;

(4) a description of the physical condition of the dam and its appurtenances, a list of the deficiencies that were observed, and a description of the severity of each observed deficiency. All deficiencies that may threaten the structural integrity of the dam shall be shown; and

(5) a survey of the dam, documented by a plan view of the dam and cross section drawings, including the following:

(A) Cross sections of the embankment every 200 feet, with each cross section starting from the upstream toe of the dam or the water surface on the upstream side to the toe of the dam on the downstream side of the dam;

(B) a profile of each open-channel spillway from the water surface on the upstream side of the dam to the point where spillway flows enter the receiving stream;

(C) a cross section of each open-channel spillway every 200 feet and at each control section, with a minimum of two cross sections;

(D) the elevation of each primary spillway inlet and outlet;

(E) the elevation of the flow line of the outlet channel; and

(F) the dimensions, locations, and descriptions of materials, workmanship, condition, apparent purpose for, and any other relevant information about all visible appurtenances in sufficient detail to represent the appurtenances in three dimensions;

(6) the dimensions and location of each deficiency noted as required in paragraph (a)(4);

(7) the estimated rate and color of discharge from drain outlets and any seeps;

(8) a determination of the hazard classification of the dam as specified in K.A.R. 5-40-24;

(9)(A) A description of the drawdown valve, if any;

(B) specification of whether the valve was operated during the inspection; and

(C) if the valve could not be operated, an explanation of why it could not be operated;

(10) the name, mailing address, and telephone number of the engineer who conducted the inspection;

(11) the name, mailing address, and telephone number of each current owner of the dam; and

(12) any other information relevant to the safety and integrity of the dam, including any items requested by the chief engineer before the inspection.

(b) If the applicant provides construction plans prepared before construction that show how the dam was to be constructed or modified and that reflect the actual dimensions of the dam as it exists, those plans may be substituted for the survey required in paragraph (a)(5).

(c) If the chief engineer determines from the inspection report that the dam does not pose a threat to public safety or public or private property and that the condition of the dam is sound, an after-the-fact permit may be issued by the chief engineer pursuant to K.S.A. 82a-301 et seq., and amendments thereto.

(d)(1) In order for an existing illegal, unpermitted hazard class A dam constructed or modified on or after May 1, 1984 or an existing illegal, unpermitted hazard class B or C dam to receive a permit from the chief engineer pursuant to K.S.A. 82a-301 et seq. and amendments thereto, the applicant shall demonstrate that the dam meets all of the applicable statutory and regulatory requirements in effect when the application for the permit is filed. The applicant shall provide a survey meeting the requirements of paragraph (a)(5) and a design report that meets the requirements of K.A.R. 5-40-2b. If plans are available that show how the dam was constructed or modified and those plans reflect the actual dimensions of the dam as it exists when the application is filed, the plans may be substituted for the required survey. If a geologic investigation was conducted before construction of the dam and the results of that investigation are available, that investigation may be substituted for the investigation and report required by K.A.R. 5-40-40 through K.A.R. 5-40-42.

(2) If the applicant cannot determine that the chief engineer's requirements for the following design or actual construction properties were met without significantly disturbing the embankment but the applicant demonstrates that the dam was built in a manner appropriate to the standards in effect when the dam was constructed, then a permit may be issued if the chief engineer determines that the dam does not pose a hazard to public safety:

(A) The location, dimensions, and composition of the backfill materials to fill the cutoff trench;

(B) the location, dimensions, and construction of cutoff collars, drains, or other seepage control;

(C) the allowance for settlement of an earthen dam;

(D) specification of whether the primary spillway pipe was tested;

(E) the specifications used; and

(F) documentation of any construction inspections. (Authorized by K.S.A. 2006 Supp. 82a-303a; implementing K.S.A. 2006 Supp. 82a-301a, 82a-302, and 82a-303a; effective May 18, 2007.)

5-40-75. Maintenance of dams. Each owner of a dam that the chief engineer has authority to regulate pursuant to K.S.A. 82a-301 et seq., and amendments thereto, shall operate and

maintain the dam in a manner that protects the public safety, complies with the terms of any permit of the chief engineer, and ensures the integrity of the dam. (Authorized by K.S.A. 2006 Supp. 82a-303a; implementing K.S.A. 2006 Supp. 82a-301a and 82a-303a; effective May 18, 2007.)

5-40-76. Repair or modification of a permitted or prejurisdictional dam. (a) The repair or modification of a permitted or prejurisdictional dam shall meet the requirements of both of the following:

(1) The statutes and the regulations in effect when the application for repair or modification is filed; and

(2) any additional criteria specified by the chief engineer that are necessary to ensure the integrity of the dam and its appurtenances.

(b) At the time of the repair or modification, the applicant shall bring the dam and all of its appurtenances into conformance with the requirements of the statutes and regulations in effect at the time of the application for repair or modification, unless both of the following conditions are met:

(1) The applicant demonstrates that bringing any feature of the dam and its appurtenances into compliance is not feasible or is unduly burdensome.

(2) The chief engineer determines that failing to bring any feature of the dam into compliance with one or more requirements applicable to that feature will not significantly affect the public safety.

(c) Each application to repair or modify a dam or its appurtenances shall include a design report on the repair or modification, including a section describing the condition of the dam at the time of the application. (Authorized by and implementing K.S.A. 2006 Supp. 82a-303a; effective May 18, 2007.)

5-40-77. Easements for dams. (a) Each applicant that applies for a permit to construct a dam, modify a dam in a manner that will raise the top of the dam, or modify the dam in any other way that will increase the backwater effect of the dam or the flow of water from the dam to the receiving stream shall demonstrate either of the following to the chief engineer:

(1) The applicant owns the site of the dam and appurtenant works, the land that will be inundated, and the land over which discharge from the dam's spillways will flow.

(2) The applicant has easements or other legal authority to perform the following for the design life of the dam:

(A) Construct and maintain the dam;

(B) inundate all of the land upstream from the dam to the top of the dam elevation; and

(C) discharge water from the spillways to a stream channel and the associated floodplain adequate to convey the discharge from the design storm.

(b) For permitted dams for which a modification is proposed, an easement or other legal authority shall be required only for the effects caused by the modification. (Authorized by K.S.A. 2006 Supp. 82a-303a; implementing K.S.A. 2006 Supp. 82a-302, K.S.A. 82a-303, and K.S.A. 2006 Supp. 82a-303a; effective May 18, 2007.)

5-40-90. Requirements for a dam safety inspection report. Each dam safety inspection report required by K.S.A. 82a-303b, and amendments thereto, shall document the observations made during the inspection and the engineer's opinion of the condition of the dam and shall include all of the following:

(a) An executive summary briefly describing the overall condition of the dam as found during the inspection;

(b) the date of the inspection and a list of the members of the inspection team;

(c) color photographs documenting the condition of the dam appurtenances and embankment and any observed deficiencies in the appurtenances and embankment;

(d) a plan view sketch of the dam and the vicinity, showing the location where each photograph was taken and the direction in which the photograph was taken;

(e) a description of the physical condition of the dam and its appurtenances, a list of any deficiencies that were observed, and a plan view sketch of the dam and its appurtenances showing the location of those deficiencies. The deficiencies that shall be shown shall include those that meet any of the following conditions:

(1) Violate the permit or approved plans or any approved modifications of the permit or approved plans;

(2) threaten the structural integrity of the dam; or

(3) threaten the safety of people or property above or below the dam;

(f) survey and other documenting data if the

engineer observes any changes from previously documented conditions in the dam or its appurtenances that could jeopardize the integrity of the dam, including any changes in the profile or cross section of the dam, profile, or cross section of any open-channel spillway, and areas of settlement or erosion;

(g) a description of the severity of each observed deficiency and the engineer's opinion about the urgency of remedying each deficiency;

(h) a summary of the engineer's review of the adequacy of the emergency action plan, including a review of any updates since the last inspection;

(i) the estimated rate and color of discharge from drain outlets and any seeps;

(j) a statement indicating whether the engineer agrees or disagrees with the hazard classification of the dam, including the reasons why the engineer agrees or disagrees with that classification;

(k) a map drawn to a scale of 1:24,000 or larger showing the location of any hazards added, removed, or not previously shown downstream of the dam, in addition to those identified in previous reports, that would require a modification of the emergency action plan or might change the hazard classification of the dam;

(l) any significant changes in the capacity of the reservoir;

(m) any significant changes in the capacity of any spillway;

(n) a statement indicating whether there have been any significant changes in the watershed and an estimate of the impact of those changes on the design hydrology;

(o) the name, mailing address, and telephone number of the engineer;

(p) the name, mailing address, and telephone number of each current owner of the dam;

(q) observations or readings from all instrumentation required by the permit, the approved plans, the approved specifications, or the chief engineer;

(r)(1) A description of the drawdown valve, if any; and

(2) specification of whether the drawdown valve was operated during the inspection and, if the valve could not be operated, an explanation of why it could not be operated; and

(s) any other information relevant to the safety of the dam, including any items requested by the chief engineer before the inspection. (Authorized by K.S.A. 2006 Supp. 82a-303a; implementing K.S.A. 2006 Supp. 82a-303a and 82a-303b; effective May 18, 2007.)

5-40-91. Schedule for inspection of hazard class C dams. Each hazard class C dam shall be inspected every third inspection year after the inspection year in which the initial inspection was completed. (Authorized by K.S.A. 2006 Supp. 82a-303a; implementing K.S.A. 2006 Supp. 82a-303a and 82a-303b; effective May 18, 2007.)

5-40-92. Schedule for inspection of hazard class B dams. Each hazard class B dam shall be inspected every fifth inspection year after its initial inspection. (Authorized by K.S.A. 2006 Supp. 82a-303a; implementing K.S.A. 2006 Supp. 82a-303a and 82a-303b; effective May 18, 2007.)

5-40-93. Schedule for inspection of dams. The initial and follow-up dam safety inspections required by K.S.A. 82a-303b, and amendments thereto, for any dam completed on or after July 1, 2002, shall be conducted and a report shall be filed with the chief engineer in accordance with the following schedule: (a) Each permitted hazard class C dam shall be inspected in the third inspection year after the inspection year in which the dam is completed and every third inspection year thereafter.

(b) Each permitted hazard class B dam shall be inspected in the fifth inspection year after the inspection year in which the dam is completed and every fifth inspection year thereafter.

(c) Each unpermitted class B or class C hazard dam completed on or after July 1, 2002, shall be inspected in accordance with a schedule approved by the chief engineer as necessary to protect the public safety.

(d) Each dam that had its hazard class increased by the chief engineer on or after July 1, 2002, shall initially be inspected by the chief engineer in the inspection year in which the hazard class is increased.

(e) If the dam was reclassified as a hazard class B dam, the dam shall be inspected every fifth inspection year after the inspection year in which the hazard class was changed.

(f) If the dam was reclassified as a hazard C dam, the dam shall be inspected every third inspection year after the inspection year in which the hazard class was changed. (Authorized by K.S.A. 2006 Supp. 82a-303a; implementing K.S.A. 2006 Supp. 82a-303a and 82a-303b; effective May 18, 2007.)

5-40-94. Revision of schedule of inspections. For good cause shown, including a change

in hazard class or repair or modification of a dam, the dam safety inspection schedule may be revised by the chief engineer and a new inspection cycle may be started. (Authorized by K.S.A. 2006 Supp. 82a-303a; implementing K.S.A. 2006 Supp. 82a-303a and 82a-303b; effective May 18, 2007.)

5-40-100. Request to be included on the list of independent engineers qualified to review applications. (a) Each licensed professional engineer who desires to be placed on the list of licensed professional engineers approved to review applications for the permit required by K.S.A. 82a-301 et seq., and amendments thereto, shall submit a request to the chief engineer on a form prescribed by the chief engineer.

(b) Any engineer may request approval in one or more of the following areas:

(1) Dam design;

(2) channel design; and

(3) the design of stream obstructions other than dams.

(c) A team of persons may be qualified to be a reviewer for a project. The qualifications of each team member shall be submitted, and one person shall be designated as the supervising reviewer. The supervising reviewer shall meet the minimum requirements for an individual reviewer. The other members of the review team shall not be required to meet the minimum requirements for an individual reviewer. (Authorized by K.S.A. 2006 Supp. 82a-303a; implementing K.S.A. 2006 Supp. 82a-302 and 82a-303a; effective May 18, 2007.)

5-40-101. Information to be submitted with a request to be a reviewer. (a) Each engineer who wants to be included on the list of licensed professional engineers approved to review applications under the obstructions in streams act, as authorized by K.S.A. 82a-302, and amendments thereto, shall submit that request on a form prescribed by the chief engineer and shall designate each area of review for which the engineer or a team of engineers desires to be approved.

(b) All of the following information shall be included on each request for each area in which the engineer seeks to be approved:

(1) The type and license number of each current license from the Kansas state board of technical professions;

(2) relevant education, including graduate and postgraduate schools attended, degrees received, and professional development work; and

(3) work experience in the requested area of expertise, including the following:

(A) The number of years of experience as an engineering intern;

(B) the number of years of experience as an engineer; and

(C) the approximate number of projects for which the engineer met the following criteria:

(i) Was responsible for the project;

(ii) performed substantive design tasks;

(iii) had quality assurance, quality control, or project review responsibilities; and

(iv) performed construction supervision or inspection; and

(D) the project name, the location, a brief description of the project, and a brief description of the engineer's responsibilities for one or two projects for which the engineer met the following criteria:

(i) Had responsible charge or performed significant portions of the design; or

(ii) provided quality control, quality assurance, project review, construction supervision, or construction inspection duties. (Authorized by K.S.A. 2006 Supp. 82a-303a; implementing K.S.A. 2006 Supp. 82a-302 and 82a-303a; effective May 18, 2007.)

5-40-102. Minimum requirements to be an individual reviewer. To be an individual reviewer, each person shall meet both of the following qualifications: (a) Have a current professional engineer's license from the Kansas state board of technical professions; and

(b) have a minimum of five years of relevant work experience in the area for which approval is sought. (Authorized by K.S.A. 2006 Supp. 82a-303a; implementing K.S.A. 2006 Supp. 82a-302 and 82a-303a; effective May 18, 2007.)

5-40-103. Conflict of interest. A reviewer shall not be eligible to review any of the following: (a) Any project in which the reviewer has participated in the project's design in any way;

(b) any project designed by any other employee of the reviewer's current employer; or

(c) any other project for which the reviewer has a conflict of interest with the owner of the dam, the designer of the dam, or the state of Kansas. (Authorized by K.S.A. 2006 Supp. 82a-303a; implementing K.S.A. 2006 Supp. 82a-302 and 82a-303a; effective May 18, 2007.)

5-40-104. Notification of approval or disapproval to be a reviewer. Within 60 days of the receipt in the office of the chief engineer of a completed request pursuant to K.A.R. 5-40-101, the requester shall be notified by the chief engineer of whether that individual has been approved in each requested area. If the chief engineer has not approved the request for each area of review requested, the requester shall be notified by the chief engineer of the reason or reasons that each request has been denied. (Authorized by K.S.A. 2006 Supp. 82a-303a; implementing K.S.A. 2006 Supp. 82a-302 and 82a-303a; effective May 18, 2007.)

5-40-105. Procedure for independent review of an application to construct a dam or other water obstruction. (a) When an applicant provides a copy of that individual's application to an approved reviewer pursuant to K.S.A. 82a-302 and amendments thereto, the applicant shall also submit the following to the chief engineer:

(1) The original application;

(2) all documentation required for an acceptable application as specified in K.A.R. 5-40-8;

(3) the statutorily required filing fee; and

(4) the name, address, and telephone number of the reviewer.

(b) The review required by the water projects environmental coordination act, K.S.A. 82a-325 et seq. and amendments thereto, shall be initiated by the chief engineer after the chief engineer receives the application.

(c) Within 37 days after the review specified in subsection (b) is initiated by the chief engineer, any comments received from the environmental review agencies shall be sent by the chief engineer to the reviewer. (Authorized by K.S.A. 2006 Supp. 82a-303a; implementing K.S.A. 2006 Supp. 82a-302 and 82a-303a; effective May 18, 2007.)

5-40-106. Report of findings of independent reviewer. (a) When a reviewer completes the review of an application pursuant to K.S.A. 82a-302 and amendments thereto, the reviewer shall submit a report of that review to the chief engineer. The report shall be properly sealed by the reviewing engineer as directed by the Kansas state board of technical professions.

(b) Each complete report shall include the following:

(1) An opinion as to whether the application meets the requirements of K.S.A. 82a-301 et seq., and amendments thereto, the regulations that implement these statutes, sound engineering principles, and commonly accepted engineering practices;

(2) the basis for that opinion, including any analyses that were performed, and the supporting data;

(3) an evaluation of the comments from the environmental review agencies that were furnished to the reviewer by the chief engineer and a recommendation about how to address all adverse comments;

(4) a recommendation about whether any request by the applicant to waive one or more regulations should be approved and the basis for approving or denying the waiver; and

(5) a recommendation about whether the chief engineer should approve or deny the permit and any conditions that the chief engineer should impose on the permit.

(c) The recommendations shall not be binding on the chief engineer. The chief engineer shall maintain the final authority to approve or deny all applications. (Authorized by K.S.A. 2006 Supp. 82a-303a; implementing K.S.A. 2006 Supp. 82a-302 and 82a-303a; effective May 18, 2007.)

Article 42.—DESIGN OF STREAM OBSTRUCTIONS

5-42-1. Stream obstructions; plans and specifications. (a) The plans required for a permit for a stream obstruction pursuant to K.S.A. 82a-301, and amendments thereto, shall include the following:

(1) A general location map or aerial photograph showing the stream, location of the proposed obstruction, sufficient detail to locate the proposed construction site, section lines, a bar scale, a north arrow, property lines with the names and addresses of adjoining landowners and any other landowners whose land may be hydraulically affected by the proposed stream obstruction, drainage area, and any other prominent features;

(2) a detailed plan view fully describing the obstruction and the site;

(3) the following topographical information, which shall be provided from streambed elevation to the limits specified in subsection (b):

(A) A profile of the streambed and both banks;

(B) a contour map with a contour interval of no more than two feet; or

(C) cross sections perpendicular to the stream

and at intervals of no more than five times the width of the channel;

(4) an elevation view showing the obstruction on a cross section of the stream and the valley up to the post project design flood elevation at the site;

(5) at least one permanent benchmark shall be conveniently located for use after construction. The location, description, and elevation of the permanent benchmark to which all elevations are referred shall be shown on the plans. Reference to the national geodetic vertical datum of 1988, or other acceptable national vertical datum, to a tolerance of plus or minus one-half foot shall be required for all stream obstructions on perennial streams and all other streams where base flood elevations have been determined and are shown on flood insurance rate maps. An assumed project datum shall be acceptable on all other stream obstruction projects;

(6) details of the manner in which the obstruction is to be tied into the bed and banks of the streams;

(7) the land for which easements or rights-of-way are to be acquired if the proposed obstruction affects land other than that owned by the applicant; and

(8) unless it is clear that the impact of the proposed project will be contained within the channel or limited to property under the control of the applicant, a hydraulic analysis determining the preproject and postproject water surface elevations for the 50 percent-chance flood and the one percent-chance flood shall be prepared and submitted to the chief engineer.

(b)(1) If it is clear that the impact of the proposed stream obstruction will be contained within the channel or limited to property under the control of the applicant, the topographical information upstream of the stream obstruction required in paragraph (a)(3) shall be required to either of the following, whichever is lower:

(A) The elevation of the highest point on the proposed obstruction; or

(B) the elevation of the one percent-chance flood water surface.

The applicant shall not be required to show topographical information for any property not under the control of the applicant.

(2) If it is not clear that the impact of the proposed project will be contained within the channel or limited to property under the control of the applicant, the topographical information upstream of the stream obstruction required in paragraph (a)(3) shall be provided from streambed elevation up to the elevation of the one percent-chance flood water surface upstream of the stream obstruction.

(3) The topographical information required in paragraph (a)(3) and subsection (b) shall be provided downstream of each proposed stream obstruction for a distance equal to five times the width of the channel at the proposed site of the stream obstruction or 50 feet downstream from the toe of the stream obstruction, whichever is greater.

(c) Each application for a permit to construct a stream obstruction shall include the following specifications:

(1) Each major element in the construction of the obstruction;

(2) the minimum quality of workmanship that is acceptable to construct the obstruction;

(3) the minimum quality of materials that is acceptable to construct the obstruction; and

(4) the materials proposed to be used to construct the obstruction.

(d) The specifications shall meet the following requirements:

(1) Be clear, legible, and shown in sufficient detail to assure that the work can be properly constructed; and

(2) be shown on the plans, in the design report, or on a separate document.

(e) If the Kansas department of transportation (KDOT) standard construction specifications meet all of the requirements of this regulation and are to be enforced during construction, referencing those specifications on the plans shall be sufficient to comply with this regulation.

(f) If the standard construction specifications of a city or county in Kansas meet the following requirements, then referencing those specifications on the plans shall be sufficient to comply with this regulation:

(1) Meet all the requirements of this regulation;

(2) are to be enforced during construction; and

(3)(A) Have been provided to the chief engineer; or

(B) are readily available at no cost from the city or county that utilizes the specifications. (Authorized by K.S.A. 2006 Supp. 82a-303a; implementing K.S.A. 2006 Supp. 82a-301, 82a-302, and 82a-303a; effective May 1, 1987; amended, T-5-12-30-91, Dec. 30, 1991; amended April 27, 1992; amended May 18, 2007.)

5-42-5. Determining the peak discharge of a one percent-chance storm. In determining the flow magnitude of a design storm, the applicant shall use one of the following methods. (a) For drainage areas of less than 640 acres, use of the rational formula shall be acceptable.

The rational formula is Q = CIA

Where C = the runoff coefficient

I = the intensity of rainfall, in inches per hour

A = the drainage area, in acres.

(b) For any drainage area, the flow magnitude of a design storm may be determined by using one of the methods in the following:

(1) "Estimation of peak streamflows for unregulated rural streams in Kansas," water-resources investigations report 00-4079, published by the United States geological survey in 2000, which is hereby adopted by reference;

(2) "urban hydrology for small watersheds," technical release 55, published by the natural resources conservation service and dated June 1986, which is hereby adopted by reference; and

(3) "computer program for project formulation," technical release 20, published by the natural resources conservation service, United States department of agriculture, and dated October 2004, which is hereby adopted by reference.

(c) For streams for which sufficient stream gaging data is available, the applicant may use sound engineering principles and commonly accepted engineering practices to estimate the peak one percent-chance discharge from the gage record.

(d) A method other than the methods specified in subsections (a), (b), and (c) may be used to determine the one percent-chance storm discharge if the method meets both of the following criteria:

(1) The method is based on sound engineering principles and commonly accepted engineering practices.

(2) The method has been previously approved, in writing, by the chief engineer. (Authorized by and implementing K.S.A. 2006 Supp. 82a-303a; effective May 18, 2007.)

Article 44.—FLOODPLAIN MANAGEMENT

5-44-7. Certification of elevations. Any elevation required to be certified to meet the requirements of this article of regulations may be certified by either a licensed land surveyor or a licensed professional engineer. (Authorized by and implementing K.S.A. 2006 Supp. 12-766; effective May 18, 2007.)

Agency 5

Kansas Department of Agriculture—Division of Water Resources

Articles

5-1. Definitions.
5-2. Vested Rights.
5-3. Appropriation Rights.
5-4. Distribution of Water Between Users.
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Article 1.—DEFINITIONS

5-1-1. Definitions. As used in these regulations and the Kansas water appropriation act, and by the division of water resources in the administration of the Kansas water appropriation act, unless the context clearly requires otherwise, the following words and phrases shall have the meanings ascribed to them in this regulation.

(a) "Above-baseflow stage" means streamflow that is in response to a significant runoff event during which period the water level elevation of the stream is greater than the elevation of the adjacent water table.

(b) "Acceptable quality surface water" means surface water that will not degrade the quality of the groundwater source into which it is discharged.

(c) "Application" means the formal document submitted on the form prescribed by the chief engineer for a permit to appropriate water for beneficial use and filed in the office of the chief engineer as provided by K.S.A. 82a-708a and 82a-709, and amendments thereto.

(d) "Approval of application" means a permit to proceed with construction of diversion works and the diversion and use of water in accordance with the terms and conditions set forth in the permit. Approval of application shall not constitute any permit that may be required by other state laws.

(e) "Aquifer storage" means the act of storing water in the unsaturated portion of an aquifer by artificial recharge for subsequent diversion and beneficial use.

(f) "Aquifer storage and recovery system" means the physical infrastructure that meets the following conditions:

(1) Is constructed and operated for artificial recharge, storage, and recovery of source water; and

(2) consists of apparatus for diversion, treatment, recharge, storage, extraction, and distribution.

(g) "Artificial recharge" means the use of source water to artificially replenish the water supply in an aquifer.

(h) "Authorized representative" means any staff employee designated by the chief engineer to perform duties and functions on behalf of the chief engineer.

(i) "Bank storage" means water absorbed by and temporarily stored in the banks and bed of a stream during above-baseflow stage.

(j) "Bank storage well" means a well used to divert or withdraw water from bank storage.

(k) "Basin storage area" means the portion of the aquifer's unsaturated zone used for aquifer storage that has defined horizontal boundaries and is delimited by the highest and lowest index water level elevations.

(l) "Basin storage loss" means that portion of artificial recharge naturally flowing or discharging from the basin storage area.

(m) "Basin term permit" means a term permit to appropriate surface water from a stream within a specific drainage basin, or a portion of it, for a reasonable quantity of water, not to exceed a maximum of 100 acre-feet per calendar year, for use in either of the following:

(1) Drilling oil and gas wells; or

(2) construction projects within the specified basin.

(n) "Battery of wells" means two or more wells connected to a common pump by a manifold, or not more than four wells in the same local source of supply within a 300-foot-radius circle that are being operated by pumps not to exceed a total maximum rate of diversion of 800 gallons per minute and that supply water to a common distribution system.

(o) "Beneficial uses of water" are the following:

(1) Domestic uses;

(2) stockwatering;

(3) municipal uses;

(4) irrigation;

(5) industrial uses;

(6) recreational uses;

(7) waterpower;

(8) artificial recharge;

(9) hydraulic dredging;

(10) contamination remediation;

(11) dewatering;

(12) fire protection;

(13) thermal exchange; and

(14) sediment control in a reservoir.

(p) "Complete and accurate water use report" means a water use report that the water right owner has filed pursuant to K.S.A. 82a-732, and amendments thereto, that provided all of the information required on the form prescribed by the chief engineer, including the following:

(1) The quantity of water diverted during the calendar year;

(2) if the diversion of water was required to be metered during the calendar year for which the

report is being filed, the information required by K.A.R. 5-3-5e;

(3) if the water was used for irrigation purposes, the number of acres that were irrigated; and

(4) if the water was diverted from a sand and gravel pit operation, the size of the surface area of the pit in acres at the end of the calendar year for which the report was filed.

(q) "Completed substantially as shown on aerial photograph, topographic map, or plat," as used to define the authorized point of diversion, means within 300 feet of the location as shown on the aerial photograph, topographic map, or plat accompanying the application.

(r) "Confined Dakota aquifer system" means that portion of the Dakota aquifer system overlain by Graneros shale.

(s) "Conjunctive use" means the safe-yield management and operation of an aquifer in coordination with a surface water system to enhance the use of the total water supply availability in accordance with the provisions of the water appropriation act.

(t) "Contamination remediation" means the diversion of water by a state agency, or under a written agreement or order of an appropriate state agency, for the purpose of improving the water quality.

(u) "Dakota aquifer system" shall include the Dakota formation, the Kiowa formation, the Cheyenne sandstone, and, where hydraulically connected, the Morrison formation.

(v) "Dakota aquifer system well" means a well or proposed well screened in whole or in part in the Dakota aquifer system.

(w) "Dam" means any artificial barrier, together with all appurtenant works, that does or could impound water.

(x) "Dewatering" means the removal of surface water or groundwater to achieve either of the following:

(1) Facilitate the construction of a building, pipeline, or other facility; or

(2) protect a building, levee, mining activity, or other facility.

(y) "Direct diversion of surface water" means the diversion of surface water directly from a stream by means of a pump, headgate, siphon, or similar installation, for application to beneficial use without storing it behind a dam, levee, or similar type of structure.

(z) "Diversion" means the act of bringing water under control by means of a well, pump, dam, or other device for delivery and distribution for the proposed use.

(aa) "Diversion works" means any well, pump, power unit, power source, dam, and any other devices necessary to bring water under control for delivery to a distribution system by which the water will be distributed to the proposed use and any other equipment required as a condition of the permit, including a check valve, water level measurement tube, meter, or other measuring device.

(bb) "Division" means the division of water resources of the Kansas department of agriculture.

(cc) "Dry hydrant" means a permanent, unpressurized intake pipe used to remove water from a pond, stream, reservoir, or other surface water supply by means of suction or vacuum supplied by a fire truck or other portable pumping device.

(dd) "Field inspection" means that for the purpose of issuing a certificate of appropriation pursuant to K.S.A. 82a-714 and amendments thereto, the chief engineer conducts a test of the rate of diversion of the diversion works under the normal and maximum conditions that the diversion works actually applied water to beneficial use during the perfection period. The chief engineer also collects all other information necessary to prepare a certificate, including the following:

(1) A description of the location and size of the place where water was actually applied to beneficial use during the perfection period in accordance with the terms, conditions, and limitations of the approval of application;

(2) information on the quantity and rate of water that was applied to the authorized use during the perfection period; and

(3) the actual location of the point or points of diversion from which water was diverted in accordance with the terms, conditions, and limitations of the approval of application.

(ee) "Fire protection" means the use of water for fire protection by a fire department for public protection in general.

(ff) "Fish farming" means the controlled cultivation and harvest of aquatic animals.

(gg) "Flow-straightening vanes" means vanes, or other device installed at the upstream throat of a measuring chamber for the purpose of aligning all velocity components of flow parallel with the flow in the measuring chamber at the water flowmeter sensor location.

(hh) "Full irrigation" means the application of water to crops during the growing season. Full irrigation shall include water for preirrigation.

(ii) "Groundwater" means water below the surface of the earth.

(jj) "Growing season" means the average frost-free period of the year.

(kk) "Household purposes" means the use of water by a person for cooking, cleaning, washing, bathing, human consumption, rest room facilities, fire protection, and other uses normally associated with the operation of a household.

(1) "Fire protection" shall be considered to be use of water for "household purposes" if either of the following conditions is met:

(A) Water is available from a "dry hydrant" that has been installed on a pond located within 1,000 feet of the residence.

(B) Water can be pumped from a well located within 1,000 feet of the residence for fire protection.

(2) Household purposes shall also include the replacement of the potential net evaporation from a domestic pond of up to ½ acre in surface area if both of the following conditions are met:

(A) The pond is utilized for aesthetic purposes as an integral part of the landscaping of a house.

(B) Any portion of the pond is located within 300 feet of the closest edge of the house.

(3) The maximum reasonable annual quantity of groundwater that may be pumped into a pond to be withdrawn later for domestic fire protection shall not exceed 0.06 acre-feet plus the average annual potential net evaporation for a pond at that location in the state having a surface area of 0.2 of an acre.

(4) Household purposes shall also include the use of 1½ acre-feet of water or less per calendar year by an industrial user, restaurant, hotel, motel, church, camp, correctional facility, educational institution, or similar entity for household purposes.

(ll) "Hydraulic dredging" means the removal of saturated aggregate from a stream channel, pit, or quarry by means of hydraulic suction and the pumping of the aggregate and water mixture as a slurry to a location where at least 95% of the water returns directly to the source of supply.

(mm) "Immediate vicinity," as used in specifying the place of use for a water right in which the water is authorized to be used for municipal purposes, means within 2,640 feet of the corporate limits of the municipality, rural water district, or other entity.

(nn) "In compliance" means that a water flowmeter does not meet any of the criteria of K.A.R. 5-1-9 for being out of compliance.

(oo) "Index water level" means water level elevations established spatially throughout a basin storage area to be used to represent the maximum volume of a basin storage area, and storage available for recovery based upon accounting methodology, and conditions of the permit.

(pp) "Indirect use" means the total of the seepage loss and the average annual potential net evaporation loss from the surface of water originally impounded in a reservoir for beneficial use.

(qq) "Industrial use" means the use of water in connection with the manufacture, production, transport, or storage of products, or the use of water in connection with providing commercial services, including water used in connection with steam electric power plants, greenhouses, fish farms, poultry operations that are not incidental to the operation of a traditional farmstead pursuant to K.S.A. 82a-701(c) and amendments thereto, secondary and tertiary oil recovery, air conditioning, heat pumps, equipment cooling, and all uses of water associated with the removal of aggregate for commercial purposes except the following:

(1) The evaporation caused by exposing the groundwater table or increasing the surface area of a stream, lake, pit, or quarry by excavation or dredging, unless the evaporation has a substantially adverse impact on the area groundwater supply; and

(2) hydraulic dredging.

(rr) "Irrigation use" means the use of water for the following:

(1) The growing of crops;

(2) the watering of gardens, orchards, and lawns exceeding two acres in area; and

(3) the watering of golf courses, parks, cemeteries, athletic fields, racetrack grounds, and similar facilities.

(ss) "Measuring chamber" means a cylindrical chamber in which a water flowmeter is installed that is calibrated to match the measuring element of the water flowmeter and the nominal size of the pipe in which it is installed.

(tt) "Municipal use" means the various uses made of water delivered through a common distribution system operated by any of the following:

(1) A municipality;

(2) a rural water district;

(3) a water district;

(4) a public wholesale water supply district;

(5) any person or entity serving 10 or more hookups for residences or mobile homes; or

(6) any other similar entity distributing water to other water users for various purposes.

Municipal use shall also include the use of water by restaurants, hotels, motels, churches, camps, correctional facilities, educational institutions, and similar entities using water that does not qualify as a domestic use.

(uu) "Nonvolatile memory" means the ability of a water flowmeter to retain the values stored in the mechanical or electronic memory if all power, including backup battery power, is removed.

(vv) "Normal operating range" means the range of flow rates for which the water flowmeter will meet the accuracy requirements of K.A.R. 5-1-4 (a), as certified by the water flowmeter manufacturer.

(ww) "Off-season irrigation" means the application of water to land for the purpose of storing moisture in the soil for future use by a crop that will not be irrigated during the growing season.

(xx) "Operator," as used in the regulation of sand and gravel pits, means any person who engages in mining sand or gravel, or both.

(yy) "Perfect" means the actions taken by a water user to develop an approval of application into a water right. These actions shall consist of the completion of the diversion works and the actual application of water to the authorized beneficial use in accordance with the terms, conditions, and limitations of the approval of application.

(zz) "Point of diversion" means the point at which water is diverted or withdrawn from a source of water supply.

(aaa) "Point of diversion for storage of surface water in a reservoir created by a dam" means the point at which the longitudinal axis of the dam crosses the centerline of the stream impounded by the reservoir.

(bbb) "Potential annual runoff" means the mean annual runoff for the watershed of the reservoir.

(ccc) "Preirrigation" means the application of water to the land for a crop before planting to ensure adequate moisture for early plant growth.

(ddd) "Primary well" means a well for which a standby well is available.

(eee) "Prior right" means a vested right, an appropriation right with earlier priority, or a permit with earlier priority than that of a subsequent appropriation right or permit.

(fff) "Proven reserves" means extractable sand and gravel deposits for which good estimates of the quantity and quality have been made by various means, including core drilling.

(ggg) "Recharge" means the natural infiltration of surface water or rainfall into an aquifer from its catchment area.

(hhh) "Recharge credit" means the quantity of water that is stored in the basin storage area and that is available for subsequent appropriation for beneficial use by the operator of the aquifer storage and recovery system.

(iii) "Recreation storage" means the storage and use of water within the reservoir for recreational use as defined in this regulation. Water stored for recreation use in a reservoir shall be considered to be an indirect use of water.

(jjj) "Recreational use" means a use of water in accordance with a water right that provides entertainment, enjoyment, relaxation, and fish and wildlife benefits.

(kkk) "Rediversion of water" means releasing or withdrawing water that had been previously impounded behind a dam, levee, or similar type of structure, by use of a pump, outlet tube, headgate, or similar type of device, and the application of the water directly to beneficial use.

(lll) "Register" means an integral or remote device that displays the quantity of water passing the water flowmeter sensor and is part of the water flowmeter.

(mmm) "Reservoir" means the area upstream from a dam that contains, or will contain, impounded water.

(nnn) "Reservoir capacity" means the volume of water that can be stored below the lower of either of the following:

(1) The elevation of the principal spillway tube; or

(2) the lowest uncontrolled spillway in the reservoir.

(ooo) "Reservoir having a total water volume of less than 15 acre-feet," as used in K.S.A. 82a-728 and amendments thereto, means a reservoir having a capacity of 15 acre-feet or less as measured at the principal spillway tube or the lowest uncontrolled spillway, whichever is lower.

(ppp) "Safe yield" means the long-term sustainable yield of the source of supply, including hydraulically connected surface water or groundwater.

(qqq) "Sand and gravel pit operation" means a project that meets the following conditions:

(1) Excavates overburden for mining sand or

gravel, or both, exposing the underlying groundwater table to evaporation; and

(2) has a perimeter equal to or greater than its depth.

(rrr) "Sediment control in a reservoir" means a beneficial use of water that meets both of the following criteria:

(1) The water is stored in a reservoir that has no other authorized type of beneficial use, except domestic use.

(2) The water is stored only in the part of the reservoir designed and constructed for the storage of sediment.

(sss) "Source water" means water used for artificial recharge that meets the following conditions:

(1) Is available for appropriation for beneficial use;

(2) is above base-flow stage in the stream;

(3) is not needed to satisfy minimum desirable streamflow requirements; and

(4) will not degrade the ambient groundwater quality in the basin storage area.

(ttt) "Specialty crop" means a crop other than a normal Kansas field crop. This term shall include turf grass, trees, vegetables, ornamentals, and other similar crops.

(uuu) "Standby well" means a well that can withdraw water from the same source of supply as the primary well and that is used only when water is temporarily unavailable from the primary well or wells authorized to be used on the same place of use because of mechanical failure, maintenance, or power failure. A standby well may also be used for fire protection or a similar type of emergency.

(vvv) "Static water level" means the depth below land surface at which the top of the groundwater is found when not affected by recent pumping.

(www) (1) "Stockwatering" means the watering of livestock and other uses of water directly related to either of the following:

(A) The operation of a feedlot with the capacity to confine 1,000 or more head of cattle; or

(B) any other confined livestock operation or dairy that would divert 15 or more acre-feet of water per calendar year.

(2) Stockwatering shall not include the irrigation of feed grains or other crops.

(3) For the purposes of this subsection, a group of feedlots or other confined feeding operations shall be considered to be one feedlot or confined feeding operation if both of these conditions are met:

(A) There are common feeding or other physical facilities.

(B) The group of facilities is under common management.

(xxx) "Straight pipe" means a straight length of pipe free of all internal obstructions, including size changes, valves, cooling coils, injection ports, sand or foreign material, and any other condition that would cause a disturbance of the internal velocity profile in the pipe. Internal obstructions shall not include properly designed, constructed, and installed straightening vanes and inspection ports.

(yyy) "Stream channel aquifer" means unconsolidated water-bearing deposits in river valleys, flood plains, and terraces that are separate and distinct from any other aquifer and capable of yielding water in sufficient quantities for beneficial use.

(zzz) "Surface water" means water in creeks, rivers, or other watercourses, and in reservoirs, lakes, and ponds.

(aaaa) "Term permit" means a permit to appropriate water issued for a specified period of time. At the end of the specified time, or any authorized extension of it, the permit shall be automatically dismissed, and any priority it may have had shall be forfeited.

(bbbb) "The production and return of saltwater in connection with the operation of oil and gas wells in accordance with the written approval granted therefor by the Kansas corporation commission pursuant to K.S.A. 55-901, and amendments thereto" means only that saltwater actually produced during the primary production of oil and gas wells and shall not include the following:

(1) Saltwater used in the drilling of an oil and gas well; and

(2) saltwater injected into an enhanced recovery injection well, unless that saltwater was produced in the primary production of the oil and gas well, separated from the oil and gas, and then subsequently reinjected.

(cccc) "Thermal exchange" means the use of water for climate control in a nondomestic building and in a manner that is essentially nonconsumptive to the source of supply.

(dddd) "Totalizer" means the mechanical or electronic portion of the register that displays the total quantity of water that has passed the water flowmeter sensor.

(eeee) "Unconfined Dakota aquifer system" means that portion of the Dakota aquifer system not overlain by Graneros shale.

(ffff) "Unconsolidated regional aquifer" means a body of mostly unconsolidated and heterogeneous water-bearing deposits that are hydraulically and geologically contiguous, and are capable of yielding water in sufficient quantities for beneficial use.

(gggg) "Waste of water" means any act or omission that causes any of the following:

(1) The diversion or withdrawal of water from a source of supply that is not used or reapplied to a beneficial use on or in connection with the place of use authorized by a vested right, an appropriation right, or an approval of application for a permit to appropriate water for beneficial use;

(2) the unreasonable deterioration of the quality of water in any source of supply, thereby causing impairment of a person's right to the use of water;

(3) the escaping and draining of water intended for irrigation use from the authorized place of use; or

(4) the application of water to an authorized beneficial use in excess of the needs for this use.

(hhhh) "Waterpower use" means the use of falling water for hydroelectric or hydromechanical power.

(iiii) "Water balance" means the method of determining the amount of water in storage in a basin storage area by accounting for inflow to, outflow from, and changes in storage in that basin storage area.

(jjjj) "Water flowmeter" means the combination of a flow-sensing device, measuring chamber, integral or remote display device or register, and any connecting parts required to make a working assemblage to measure, record, and allow determination of flow rate and total quantity of water flowing past the water flowmeter sensor.

(kkkk) "Water storage device" means a reservoir, elevated water tank, pressurized water tank, including a bladder tank, or other container into which water is pumped and stored before beneficial use.

(llll) "Water use correspondent" means a person designated in writing, on a form prescribed by the chief engineer, by one of the owners of a water right to file the water use reports required by K.S.A. 82a-732 and amendments thereto, on behalf of the owner or owners of that water right. (Authorized by and implementing K.S.A. 82a-706a; modified, L. 1978, ch. 460, May 1, 1978; amended May 1, 1980; amended May 1, 1981; amended May 1, 1983; amended May 1, 1986; amended Dec. 3, 1990; amended May 31, 1994; amended Sept. 22, 2000; amended Oct. 24, 2003.)

5-1-2. Standby well. In order for a well to qualify as a standby well:

(a) The well shall be maintained in operable condition and be capable of being hooked to a power source within a reasonable amount of time to allow the well to function effectively as a standby well.

(b) Both the primary well or wells and the standby well or wells shall be required to be metered by order of the chief engineer or as a condition of the water right or permit.

(c) The standby well shall be located close enough to the primary well so that both wells withdraw water from the same local source of supply.

(d) The standby well shall be authorized to divert the same rate and quantity as the primary well or wells. A limitation clause shall be placed on any water right or permit authorizing a standby well or wells limiting the standby well to no more than the rate and quantity authorized for the primary well or wells. With the limitation clause or clauses in effect, the standby well or wells shall not be counted in any safe yield, allowable appropriation, depletion or similar type of analysis. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706; effective May 31, 1994.)

5-1-3. Permitting requirements of the Kansas water appropriation act. An individual engaged in the drilling of water well test holes, seismic test holes, stratigraphic test holes, observation wells, and water quality sampling wells, shall not be required to have an approval of application pursuant to the Kansas water appropriation act if water will not be diverted for beneficial use. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-701(f), 82a-703, 82a-705, and K.S.A. 1999 Supp. 82a-711; effective Sept. 22, 2000.)

5-1-4. Water flowmeter specifications. Each water flowmeter required by the chief engineer, or required pursuant to a regulation adopted by the chief engineer, on or after the effective date of this regulation shall meet the following minimum requirements:

(a)(1) The water flowmeter has been certified by the manufacturer to register neither less than 98

percent nor more than 102 percent of the actual volume of water passing the water flowmeter when installed according to the manufacturer's instructions. This requirement shall be met throughout the water flowmeter's normal operating range without further adjustment or calibration.

(2) The manufacturer has certified to the chief engineer that it has an effective quality assurance program, including wet testing a random sample of production line water flowmeters with water flowmeter test equipment. The minimum number of samples to be tested shall be determined using a confidence interval of 90 percent, an expected compliance of 95 percent, and an acceptable error of two percent. The minimum number of samples of each model that shall be tested shall be calculated by multiplying 1,300 times the annual production of that model of water flowmeter divided by Q. Q equals four times the annual production of that water flowmeter plus 1,300.

(3) The manufacturer has certified that the water flowmeter test equipment described in paragraph (a)(2) has been tested annually and found accurate by standards traceable to the national institute of standards and technology (NIST). Documentation of the testing required in paragraphs (a)(1) and (2) shall be maintained by the manufacturer for a period of at least five years and shall be made available to the chief engineer upon request during normal business hours.

(b) The water flowmeter shall be designed and constructed so that it will meet the following criteria:

(1) Maintain the accuracy required by the chief engineer in K.A.R. 5-1-4(a) and K.A.R. 5-1-9(a);

(2) be protected by the following:

(A) A seal installed by the manufacturer or an authorized representative of the manufacturer; or

(B) a way that makes it impossible to alter the totalizer reading without breaking the seal or obtaining the authorization of the manufacturer, an authorized representative of the manufacturer, or the chief engineer;

(3) clearly indicate the direction of water flow;

(4) clearly indicate the serial number of the water flowmeter;

(5) have a weatherproof register that is sealed from all water sources;

(6) have a register that is readable at all times, whether the system is operating or not;

(7) be able to be sealed by an authorized representative of the chief engineer to prevent unauthorized manipulation of, tampering with, or removal of the water flowmeter;

(8) be equipped with a manufacturer-approved measuring chamber through which all water flows. Except for positive displacement water flowmeters, full-bore electromagnetic water flowmeters, and multijet water flowmeters, flow-straightening vanes shall be installed at the upstream throat of the water flowmeter chamber. The flow-straightening vanes shall meet either of the following criteria:

(A) Be designed and installed by the manufacturer, or an authorized representative of the manufacturer; or

(B) consist of at least three vanes that meet the following conditions:

(i) Are longer, when placed parallel to the length of the pipe, than the inside diameter of the pipe;

(ii) are equally spaced radially on the inner periphery of the pipe; and

(iii) are wider in diametrical distance than one-fourth of the inside diameter of the pipe;

(9) be equipped with an inspection port if the straightening vanes are not designed, constructed, and installed by the manufacturer or an authorized representative of the manufacturer. The port shall be of sufficient size and placement to allow determination of the following:

(A) The proper installation of the flow-straightening vanes; and

(B) the inside diameter of the pipe in which the water flowmeter sensor is installed;

(10) remain operable without need for recalibration to maintain accuracy throughout the operating life of the water flowmeter; and

(11) have a totalizer that meets the following criteria:

(A) Is continuously updated to read directly only in acre-feet, acre-inches, or gallons;

(B) has sufficient capacity, without cycling past zero more than once each year, to record the quantity of water diverted in any one calendar year;

(C) reads in units small enough to discriminate the annual water use to within the nearest 0.1 percent of the total annual permitted quantity of water;

(D) has a dial or counter that can be timed with a stopwatch over not more than a 10-minute period to accurately determine the rate of flow under normal operating conditions; and

(E) has a nonvolatile memory.

(c) Each water flowmeter that is required to be installed by the chief engineer, or that was required to be installed as a condition of either an approval of application or an order of the chief engineer, or pursuant to a regulation adopted by the chief engineer before the effective date of this regulation, shall meet the following minimum specifications:

(1) Each water flowmeter shall be of the proper size, pressure rating, and style, and shall have a normal operating range sufficient to accurately measure the water flow passing the water flowmeter under normal operating conditions.

(2) Each water flowmeter shall meet the accuracy requirements of K.A.R. 5-1-9(a). If the water flowmeter does not meet the accuracy requirements of K.A.R. 5-1-9(a), then the water flowmeter shall meet either of the following criteria:

(A) Be repaired so that it can meet the accuracy requirements of K.A.R. 5-1-9(a); or

(B) be replaced with a water flowmeter complying with all of the requirements of K.A.R. 5-1-4 and installed in a manner that meets the requirements of K.A.R. 5-1-6. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706a and K.S.A. 82a-706c; effective Sept. 22, 2000; amended Oct. 24, 2003.)

5-1-5. Variances from water flowmeter specifications. (a) A variance from the chief engineer's water flowmeter specifications may be granted by the chief engineer if the water right owner furnishes detailed specifications of a proposed water flowmeter and demonstrates to the chief engineer all the following:

(1) A water flowmeter meeting the specifications of K.A.R. 5-1-4 will not satisfactorily serve the water user's needs.

(2) The proposed water flowmeter will meet the accuracy requirements of K.A.R. 5-1- 4(a) and (b).

(3) The proposed water flowmeter will provide a reliable and accurate water use record for that point of diversion.

(b) Variances shall be granted only on a site-by-site, case-by-case basis. No general variances shall be granted for any brand or model of water flowmeter, except as set forth in subsection (c).

(c) A limited variance shall be granted by the chief engineer for a period of up to three years to allow that specific brand and model of a water flowmeter to be tested in the field and to serve as a water flowmeter required by the chief engineer if all of the following conditions are met:

(1) The manufacturer demonstrates to the chief engineer that a particular model and brand of water flowmeter utilizes new technology, does not meet one or more of the requirements of K.A.R. 5-1-4, and is likely to be as reliable, or more reliable, than water flowmeters currently meeting all of the requirements of K.A.R. 5-1-4.

(2) The manufacturer agrees to install not more than 50, nor less than 10, water flowmeters to test the new technology.

(3) The manufacturer agrees to collect data for at least one year that is sufficient to allow the chief engineer to determine whether that brand and model of water flowmeter meets the reliability and accuracy specifications of K.A.R. 5-1-4. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706c; effective Sept. 22, 2000.)

5-1-6. Water flowmeter installation specifications. (a) Each water flowmeter required by the chief engineer to be installed or required pursuant to a regulation adopted by the chief engineer, on or after the effective date of these regulations shall meet the following minimum water flowmeter installation specifications:

(1) Each water flowmeter shall be installed in a manner that meets the following criteria:

(A) Meets or exceeds the instructions of the manufacturer; and

(B) except for a multijet and a positive displacement water flowmeter, is installed so that there are at least five pipe diameters of straight pipe upstream and at least two pipe diameters of straight pipe downstream of the sensor portion of the water flowmeter, regardless of the manufacturer's installation specifications.

(2) Each water flowmeter shall be sized and installed so that full pipe flow will be maintained through the water flowmeter and so that water velocity in the measuring chamber will be within the normal operating range of the water flowmeter at all times while water is being diverted.

(3) If a water flowmeter is located downstream of a water storage device, there shall be at least seven diameters of straight pipe upstream of the water storage device where a water flowmeter may be installed for a field test by the chief engineer.

(4) Each water flowmeter shall be installed at a location at which the flowmeter measures all water diverted from the source of supply and does

not measure water or other discharge, including tailwater and sewage effluent.

(b) Each water flowmeter that is required by the chief engineer to be installed, or that was required to be installed as a condition of either an approval of application or an order of the chief engineer, or pursuant to a regulation adopted by the chief engineer, before the effective date of these regulations, shall meet the following minimum installation specifications:

(1) Each water flowmeter shall be installed in a manner that meets or exceeds the instructions of the manufacturer and, except for a multijet and a positive displacement water flowmeter, shall be installed so that there are at least five pipe diameters of straight pipe upstream and at least two pipe diameters of straight pipe downstream of the sensor portion of the water flowmeter, regardless of the manufacturer's installation specifications.

(2) Each water flowmeter shall be sized and installed so that full pipe flow will be maintained through the water flowmeter and so that water velocity in the measuring chamber will be within the normal operating range of the water flowmeter at all times while the water is being diverted.

(3) Each water flowmeter shall be installed at a location at which the flowmeter measures all water diverted from the source of supply and does not measure water or other discharge, including tailwater and sewage effluent. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706a and K.S.A. 82a-706c; effective Sept. 22, 2000; amended Oct. 24, 2003.)

5-1-7. Requirement to install a water flowmeter or other suitable water-measuring device. (a) All nondomestic, nontemporary wells and pump sites operated under the authority of an approval of application issued on or after the effective date of this regulation shall be equipped with a water flowmeter that meets or exceeds the specifications of the chief engineer effective at the time the application is approved by the chief engineer.

(b)(1) All nondomestic, nontemporary gravity diversions of water, including irrigation ditches, operating under the authority of an approval of application issued on or after the effective date of this regulation shall be equipped with a continuous recording gauge, or other suitable water-measuring device located at or near the headgate. Before installation, the water right owner shall submit plans and specifications for the proposed gauge, or other suitable water-measuring device, to the chief engineer and shall receive approval in writing from the chief engineer before installing the gauge or other suitable water-measuring device.

(2) The gauge or other suitable water-measuring device shall meet the following criteria:

(A) Register not less than 94% and not more than 106% of the actual volume of water passing the device under normal operating conditions when compared to a field test made by, or approved by, the chief engineer;

(B) be installed in accordance with the installation requirements of the chief engineer; and

(C) be maintained in a satisfactory operating condition any time water can reasonably be expected to be diverted.

(c) An approval of a nondomestic application for change in place of use, the point of diversion, or the use made of the water, or any combination of these, shall require the owner of the well or pump site to install a water flowmeter on all points of diversion authorized by the water right or approval of application, unless any of the following conditions is met:

(1) The applicant demonstrates to the chief engineer that the application to change the place of use meets the requirements of K.A.R. 5-5-11(e).

(2) The applicant demonstrates to the chief engineer both of the following:

(A) Installation of a water flowmeter meeting these specifications is not physically feasible.

(B) The applicant agrees to implement a reasonable, objective alternative of measuring the quantity of water diverted that is acceptable to the chief engineer.

(3) The water is being diverted from multiple points of diversion authorized by one water right that does not limit the maximum annual quantity and maximum rate of diversion by point of diversion, and all of the water flows to a common point where a water flowmeter meeting the requirements of K.A.R. 5-1-4 and K.A.R. 5-1-6 measures all of the water pumped from all of the points of diversion authorized by that water right.

(4) An application for change in point of diversion only is filed to change the point of diversion of only one well, when more than one well is authorized by the approval of application or water right that authorizes the well for which a change in point of diversion is sought. In this case, only the well that is being relocated shall be required to have a water flowmeter.

(d) Except as set forth in subsection (c), if an approval of an application for change requires the installation of a water flowmeter, the requirement to install a water flowmeter shall also be placed on all other water rights and approvals authorizing diversion of water from the same point of diversion.

(e) If any water right or approval of application has a condition requiring development, adoption, and implementation of a water conservation plan pursuant to K.S.A. 82a-733 and amendments thereto, a water flowmeter or suitable water-measuring device shall be installed on each authorized point of diversion in compliance with these regulations.

(f) The owner of a water right, including a domestic water right, or an approval of application shall also be required by the chief engineer to install a water flowmeter or other suitable water-measurement device that complies with these regulations on each authorized point of diversion if it is necessary for the chief engineer to effectively administer water rights to prevent impairment, to protect minimum desirable stream flows, to conserve water, or to otherwise carry out the duties of the chief engineer as set forth in the Kansas water appropriation act, K.S.A. 82a-701 et seq., and amendments thereto.

(g) Except as set forth in subsection (c), if a water flowmeter is required by the chief engineer, each point of diversion authorized by the approval of application or water right shall be required to have a separate meter. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706c; effective Sept. 22, 2000.)

5-1-8. Water flowmeter maintenance. If a water right owner is required by the chief engineer to install a water flowmeter, the water right owner shall maintain the water flowmeter in compliance, as defined by K.A.R. 5-1-1, whenever diversion of water can reasonably be expected to occur. If at any time the required water flowmeter fails to function properly, the owner shall promptly initiate action to repair or replace the meter, or to correct any problems with the installation. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706c; effective Sept. 22, 2000.)

5-1-9. Criteria to determine when a water flowmeter is out of compliance. A water flowmeter shall be considered to be out of compliance if any of the following criteria is met: (a) The water flowmeter registers less than 94 percent or more than 106 percent of the actual volume of flow water passing the water flowmeter. If necessary, this determination may be made by a field test conducted by, or approved by, the chief engineer.

(b) The seal placed on the totalizer by the manufacturer or the manufacturer's authorized representative has been broken, or the totalizer value has been reset or altered without the authorization of the manufacturer, an authorized representative of the manufacturer, or the chief engineer.

(c) A seal placed on the water flowmeter or totalizer by the chief engineer has been broken.

(d) The water flowmeter register is not clearly visible or is unreadable for any reason.

(e) There is not full pipe flow through the water flowmeter.

(f) Flow-straightening vanes have not been properly designed, manufactured, and installed.

(g) The water flowmeter is not calibrated for the nominal size of the pipe in which it is installed.

(h) The water flowmeter is not installed in accordance with the manufacturer's installation specifications. However, five diameters of straight pipe above the water flowmeter sensor and two diameters below the water flowmeter sensor shall be the minimum spacing, regardless of the manufacturer's installation specifications.

(i) A water flowmeter is installed at a location at which the flowmeter does not measure all of the water diverted from the source of supply. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706a and K.S.A. 82a-706c; effective Sept. 22, 2000; amended Oct. 24, 2003.)

5-1-10. Duties of water right owner when a water flowmeter is out of compliance.

(a) A water right owner, or the water right owner's authorized designee, shall promptly notify the chief engineer if any water flowmeter required by the chief engineer is out of compliance.

(b) Within 30 days after the date on which the out-of-compliance water flowmeter has been repaired or replaced, the water right owner or the water right owner's authorized designee shall notify the chief engineer in writing of the following information:

(1) The date the water flowmeter became out of compliance;

(2) the water flowmeter reading at the time the water flowmeter became out of compliance;

(3) if the water flowmeter was replaced, the following information:

(A) The brand, model, size, and serial number of the new water flowmeter;

(B) the units in which the new water flowmeter reads;

(C) the reading of the new water flowmeter at the time of installation; and

(D) the location of the new water flowmeter on the diversion works or delivery system;

(4) if the water flowmeter was repaired, the water flowmeter reading immediately before the repair and the reading of the water flowmeter at the time it was reinstalled or the repair was completed on site;

(5) the date the repair or replacement was completed; and

(6) the amount of water diverted while the water flowmeter was out of compliance.

(c) If the water right owner does not maintain a record of diversions of water that is sufficient to reasonably estimate the quantity of water diverted while the water flowmeter was out of compliance, it shall be assumed, for the sole purposes of enforcement of the terms, conditions, and limitations of the approval of application or water right, and priority administration of water rights among water users, that the diversion works were operated continuously at the tested rate of diversion during the entire period the water flowmeter was out of compliance. If the rate of diversion has not been tested by the chief engineer, then it shall be assumed that the diversion works were operated continuously at the authorized rate of diversion during the entire time the water flowmeter was out of compliance. The assumption set forth in this subsection shall not apply to the determination of the annual quantity of water diverted for the purpose of perfecting a water right.

(d) If the water right owner is required by the chief engineer to repair or replace an inoperable water flowmeter, it shall be the duty of the water right owner to ensure that the repaired or replaced water flowmeter is in compliance with K.A.R. 5-1-4 and K.A.R. 5-1-6. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706c; effective Sept. 22, 2000.)

5-1-11. Water flowmeter testing by a nonagency person. If a water right owner desires to have a water flowmeter flow rate test done by a nonagency person for any reason, a person may be approved by the chief engineer to perform a water flowmeter flow rate test if the person demonstrates to the chief engineer both of the following:

(a) The person has the training, skills, and experience necessary to properly conduct the test.

(b) The person has the appropriate water flowmeter to do the test, and the water flowmeter has been tested for accuracy with water flowmeter test equipment that has been found to be accurate using standards traceable to the national institute of standards and technology (NIST). The equipment shall have been tested and found to be accurate within 12 months of performing the water flowmeter test. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706c; effective Sept. 22, 2000.)

5-1-12. List of water flowmeters certified by the manufacturer to meet the specifications of the chief engineer. (a) A list of all makes and models of water flowmeters that have been certified by the water flowmeter manufacturer to meet the specifications of the chief engineer shall be maintained by the chief engineer. This list shall be made available by the chief engineer to the public upon request.

(b) A water flowmeter shall be placed on the list only if the manufacturer has submitted to the chief engineer all of the following information for each water flowmeter model:

(1) The water flowmeter manufacturer's name, address, contact person's name, and telephone number;

(2) the water flowmeter model name or number;

(3) proof that a random sample of water flowmeters of each model has been tested in accordance with the requirements of K.A.R. 5-1-4(a);

(4) the last date that the water flowmeter test equipment was tested and found to be accurate by standards traceable to the national institute of standards and technology (NIST);

(5) verification that the water flowmeter is designed and constructed so that accuracy will be maintained over the life of the water flowmeter;

(6) verification that the water flowmeter serial number and direction of flow are clearly indicated on the water flowmeter;

(7) verification that the register is weatherproof and sealed from all water sources;

(8) verification that the totalizer will read only in acre-feet, acre-inches, or gallons;

(9) the number of active digits in the totalizer;

(10) verification that the memory is nonvolatile;

(11) verification that the totalizer cannot be reset without breaking the manufacturer's seal or obtaining the authorization of the manufacturer, an authorized representative of the manufacturer, or the chief engineer;

(12) verification that the water flowmeter and register are constructed in such a manner that they can be sealed by the chief engineer;

(13) a description of the measuring chamber provided for each water flowmeter model;

(14) specifications of the flow-straightening vanes installed in the measuring chamber;

(15) the spacing recommendations for each water flowmeter model in terms of pipe diameters of straight pipe required upstream and downstream of the water flowmeter sensor; and

(16) the normal operating range of the water flowmeter.

(c) A brand or model of a water flowmeter shall be removed from the list of water flowmeters specified in subsection (a) of this regulation if it has been demonstrated to the chief engineer that the brand or model of water flowmeter does not reliably and consistently meet the accuracy standards of K.A.R. 5-1-9(a). (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706a and K.S.A. 82a-706c; effective Sept. 22, 2000; amended Oct. 24, 2003.)

Article 2.—VESTED RIGHTS

5-2-1 and 5-2-2. Not in active use.

Editor's Note:

Proposed regulations 5-2-1 and 5-2-2 were rejected by the legislature, see L. 1978, ch. 460.

5-2-3. Battery of wells. Except as set forth in subsection (c), if a permit to appropriate water did not authorize a battery of wells, as defined in K.A.R. 5-1-1, before the effective date of this regulation, an application for change filed pursuant to K.S.A. 82a-708b, and amendments thereto, to add one or more wells to the authorized well to create a battery of wells shall not be approved unless all of the following criteria in either subsection (a) or (b) are met at the time that the application for change is filed:

(a) (1) The time to construct the diversion works has not expired.

(2) The proposed battery will meet the definition of a battery of wells as defined in K.A.R. 5-1-1.

(b) (1) The time to construct the diversion works has expired.

(2) A new application to appropriate water filed to appropriate water at the geocenter of the proposed battery of wells would meet the safe yield, allowable appropriation, or similar type of regulation, for a well filed at that location.

(3) The proposed battery of wells meets the definition of a battery of wells as defined in K.A.R. 5-1-1.

(c) Subsections (a) and (b) shall not apply to an application to change the point of diversion filed to add one or more wells to the authorized well to create a battery of wells if the proposed battery of wells is located within the boundary of a groundwater management district for which the chief engineer has adopted a specific regulation applicable to batteries of wells within that district. (Authorized by and implementing K.S.A. 82a-706a; effective Sept. 22, 2000.)

Article 3.—APPROPRIATION RIGHTS

5-3-1. Application acceptable for filing. (a) To be acceptable for filing, an application for an approval of application shall be accompanied by the statutorily required filing fee, except for an application for domestic use, and shall contain all of the following:

(1) The name and mailing address of each applicant;

(2) the signature of each applicant or each authorized representative;

(3) the proposed source of water supply;

(4) the proposed authorized place of use; and

(5) either a description of the location of the proposed point of diversion or a request for a 60-day period of time in which to establish the proposed point of diversion within a specifically described, nominal legal quarter section of land.

(b) When an application is received in the office of the chief engineer and assigned a number, the maximum quantity of water per calendar year and the maximum rate of diversion shall not be increased. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706a and K.S.A. 82a-709; modified, L. 1978, ch. 460, May 1, 1978; amended May 1, 1980; amended Oct. 24, 2003.)

5-3-1a. Application for a basin term permit. An application for a basin term permit shall be filed on a form prescribed by the chief engineer. The term requested shall not exceed one year. A basin term permit may be extended in one-year increments if all of the following conditions are met:

(a) The request for extension is filed before the end of the current term in a manner acceptable to the chief engineer.

(b) The applicant has complied with the terms, conditions, and limitations of the basin term permit during the previous calendar year.

(c) Granting the requested extension will not cause impairment of each approval of application and water right with an earlier priority.

(d) The applicant shows good cause why the extension should be granted.

The total time authorized by a basin term permit shall not exceed five calendar years. Basin term permits shall not be transferable. At the end of the specified term, the permit shall be dismissed, and any priority it may have had shall be forfeited. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-712; effective Sept. 22, 2000.)

5-3-1b. Complete new application. (a) A new application to appropriate water for beneficial use shall be considered to be a "complete application" for the purposes of K.S.A. 82a-708a, and amendments thereto, if the application completely and accurately meets all the requirements specified in this regulation and the following criteria:

(1) The requirements specified in K.S.A. 82a-708a, and amendments thereto;

(2) the requirements specified in K.S.A. 82a-709, and amendments thereto;

(3) the requirements specified in K.S.A. 82a-710, and amendments thereto;

(4) any water conservation plans required by the chief engineer pursuant to K.S.A. 82a-733, and amendments thereto;

(5) the requirements of K.S.A. 82a-301 through K.S.A. 82a-305a, and amendments thereto, if the proposed point of diversion, or rediversion, is a dam or stream obstruction;

(6) the requirements specified in K.A.R. 5-3-1;

(7) the requirements specified in K.A.R. 5-3-4; and

(8) the requirements specified in K.A.R. 5-3-4d.

(b) If minimum desirable streamflow (MDS) requirements have been set for the proposed source of water supply, the application shall contain a statement signed by the applicant acknowledging that the MDS requirements apply to the proposed source of water supply and that the diversions of water authorized by this approval of application could be regulated at times to protect MDS.

(c) If the applicant is requesting a waiver or exemption of a regulation pursuant to K.S.A. 82a-1904, and amendments thereto, the applicant shall submit a written request for the waiver or exemption, and documentation to support the waiver or exemption.

(d) If the proposed point of diversion is located within the boundaries of a groundwater management district, a final recommendation or analysis of the availability of water has been received from the groundwater management district within the time limit set by the chief engineer concerning the approval, denial, or modification of the application.

(e) If a substantive question has been raised concerning whether approval of the application could cause impairment of senior water rights or prejudicially and unreasonably affect the public interest, the applicant shall submit sufficient information to resolve that question.

(f) If any actions are required to be taken by the applicant on other approvals of applications or water rights owned by the applicant in order to make the new application approvable, including dismissals, reductions in water rights in accordance with K.A.R. 5-7-5, and applications for change, all necessary forms shall be completed and filed with the chief engineer.

(g) The applicant shall submit all information and data necessary to demonstrate that the application complies with the applicable regulations adopted by the chief engineer. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706a, K.S.A. 2002 Supp. 82a-708a, K.S.A. 82a-709, K.S.A. 82a-710, K.S.A. 2002 Supp. 82a-711, K.S.A. 82a-733, and K.S.A. 2002 Supp. 82a-1904; effective Oct. 24, 2003.)

5-3-2. Priorities. (a) Upon receipt in the office of the chief engineer of an acceptable application for permit to appropriate water for beneficial use, accompanied by the statutory application fee, a stamp showing the date and time of receipt shall be placed on the application form. The date and time of receipt of the application for any use, other than domestic, shall establish the priority of whatever appropriation right that may be subsequently perfected pursuant to the application; (b) The date and time of the receipt of an application for permit to appropriate water for domestic use or the date of the first use of water for such purpose, whichever is earlier, shall establish

the priority of the appropriation right for domestic use. When the first use of water is earlier in time than the filing date of an application, the applicant shall furnish affidavits from disinterested parties to substantiate the date that water was first used from the appropriate water supply for domestic purposes. (Authorized by K.S.A. 82a-706a; modified, L. 1978, ch. 460, May 1, 1978.)

5-3-3. Storage of water for domestic use. Any person entitled to use water for beneficial purposes may collect and store the same so long as such collection, storage, use and times of use thereafter are consistent with reasonable storage and conservation practices. A reasonable quantity of water stored for domestic use shall be considered to be that quantity sufficient to satisfy the domestic use for the current year and two succeeding years. (Authorized by K.S.A. 82a-706a; modified, L. 1978, ch. 460, May 1, 1978.)

5-3-3a. Legal access. If the chief engineer is aware, or becomes aware, that the applicant does not have legal access to either the point of diversion or the place of use, before an application for any of the following can be approved by the chief engineer, the applicant shall demonstrate that the applicant has legal access to the proposed point of diversion and the proposed place of use before the approval of the application: (a) An approval of application;

(b) a change in place of use;

(c) a change in point of diversion; or

(d) any combination of subsections (a), (b), and (c). (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-708a; effective Oct. 24, 2003.)

5-3-4. Application contents. (a) Each application for permit to appropriate water for beneficial use shall contain all the information requested for the proposed uses as set forth in the prescribed application form and such other information as may be required for a proper understanding of the proposed appropriation.

(b) Each application shall be accompanied by an aerial photograph or a detailed plat preferably to a scale of one (1) inch equals one thousand three hundred and twenty (1,320) feet, or a U.S. geological survey topographic map, scale 1:24,000. Information that shall be plotted on the plat, photograph, or topographic map is as follows:

(1) The section corners.

(2) The center of the section, identified by the section number, township and range.

(3) The location of the point of diversion—well location, stream bank pump site, dam location or location of other works for diversion of water—indicated by an appropriate symbol.

(4) The location of the place of use identified by crosshatching or by some other appropriate method.

(5) The location of all other water wells of every kind within one-half (½) mile of the well(s) covered by the proposed appropriation, each of which shall be identified as to its use and the name and mailing address of the owner, if the proposed appropriation is for use of groundwater.

(6) The name and mailing address of the owner(s) of each tract of land adjacent to the stream for a distance of one-half (½) mile upstream and one-half (½) mile downstream from the property lines of the land owned or controlled by the applicant, if the proposed appropriation is for the use of surface water.

(7) The locations of proposed or existing dams, dikes, reservoirs, canals, pipelines, power houses and other structures for the purpose of storing, conveying or using water.

(8) A north arrow and scale.

The information shown on the photograph or plat shall be legible. Black line prints may be submitted in lieu of the original drawing if a plat is submitted.

(c) Separate applications shall be filed for surface water and groundwater.

(d) If the source of supply is groundwater, a separate application shall be filed for each proposed well or battery of wells, except that up to four (4) wells within a circle with a quarter (¼) mile radius in the same local source of supply which do not exceed a maximum diversion rate of twenty (20) gallons per minute per well and which are operated by means of submersible pumps may be included in a single application. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-709; modified, L. 1978, ch. 460, May 1, 1978; amended May 1, 1980; amended May 1, 1981.)

5-3-4a. Hearing prior to approval of application. A hearing may be held before the chief engineer, or a person designated by the chief engineer, on an application to appropriate water for beneficial use prior to approval, when the chief engineer finds it to be in the public interest to hold a hearing, or a hearing has been requested

by a person who shows to the satisfaction of the chief engineer that approval of the application may cause impairment of senior water rights or permits. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 1993 Supp. 82a-711; effective May 1, 1980; amended May 31, 1994.)

5-3-4b. Deadlines for return of documents. (a) If the chief engineer allows a person a specific number of days to return or submit a document or other information, the time period shall be computed as prescribed in K.S.A. 60-206(a) and (e), and amendments thereto.

(b) If a person is given until a specific date to return or submit a document or other information, the document or information shall be deemed to be timely filed if it is received in the office of the chief engineer no later than the third working day following the specified date. Working days shall be all days except Saturdays, Sundays, and legal holidays designated by the United States congress, the Kansas legislature, or the governor of Kansas. Half holidays shall be counted as working days.

(c) Any document that is postmarked by the United States postal service with a legible date on or before the deadline set by the division for returning the document shall be accepted by the division as being timely filed, regardless of when it is received. In the case of United States registered mail, the date of registration shall be deemed to be the postmark date. The term "United States postal service," as used in this subsection, shall include a private delivery service available to the general public that routinely records, in the regular course of business, the date the item is given to the service for delivery. The date the item is given to the service for delivery shall be deemed to be the postmark date. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-710; effective May 1, 1980; amended Sept. 22, 2000.)

5-3-4c. Retaining new applications. (a) A new application to appropriate water for beneficial use shall be held by the chief engineer in accordance with the terms of subsection (b) if the application meets both of the following conditions:

(1) The application is in proper form and has been completely processed, but cannot be approved because it does not currently comply with one or more statutory or regulatory requirements, including spacing, safe yield, and allowable appropriation regulations.

(2) There is good cause to believe that, if the application were held for a reasonable period of time, it may be approvable in the future because of actions currently pending on other permits and water rights in the area, including issuance of certificates, dismissals of applications, and declarations of abandonment.

(b) Upon demonstration by the applicant to the chief engineer that the application apparently could be approved within a reasonable time, not to exceed 365 days from the date the request to retain the application was received by the chief engineer, if the pending actions take place, the applicant's pending new application may be held by the chief engineer for a period not to exceed 365 days.

(c) If the application still cannot be approved at the end of the time set forth in section (b), the application shall be dismissed by the chief engineer and the priority of the application forfeited.

(d) If any prior applications to appropriate water or prior applications to change the point of diversion from the same source of supply are not complete and if the approval or denial of these applications could affect the approval of the proposed new application or application to change a water right, then the 150-day period specified in K.S.A. 82a-708a, and amendments thereto, shall begin to run only after all these prior applications have been processed. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-705, K.S.A 82a-706a, K.S.A. 2002 Supp. 82a-708a, and K.S.A. 82a-710; effective Sept. 22, 2000; amended Oct. 24, 2003.)

5-3-4d. Stratigraphic log requirements. (a) Except as set forth in subsection (b), each applicant who files either of the following applications shall submit to the chief engineer a stratigraphic log for a test hole located within 300 feet of the proposed new or replacement well:

(1) A new application to appropriate groundwater, except for domestic use, a temporary permit, or a term permit for fewer than five years; or

(2) an application to change the point of diversion to relocate a well.

This stratigraphic log shall contain geologic and any other information sufficient to allow the chief engineer to understand the lithology and to classify the groundwater source formation or formations from which the proposed well will be withdrawing water.

(b) (1) If an application is filed for a new well, the stratigraphic log shall not be required if the

chief engineer has sufficient information to understand the lithology and determine the groundwater source formation or formations from which the proposed well will be withdrawing water.

(2) If an application is filed for a change in point of diversion, the stratigraphic log shall not be required if the chief engineer has sufficient information to understand the lithology and determine the groundwater source formation or formations from which the original well withdrew water and the replacement well will withdraw water.

(c) Each applicant to construct a new well or to change the point of diversion to a newly constructed well who submitted a stratigraphic log to the chief engineer pursuant to subsection (a) above shall not be required to submit to the chief engineer a copy of the stratigraphic log of the completed well as required by the Kansas department of health and environment under the authority of K.S.A. 82a-1212 and amendments thereto. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706a, K.S.A. 82a-709, and K.S.A. 82a-710; effective Sept. 22, 2000; amended Oct. 24, 2003.)

5-3-4e. Groundwater source formation codes. The Kansas department of agriculture, division of water resources' document titled "groundwater source formation codes," dated June 24, 2004, is hereby adopted by reference. The groundwater source formation codes used by the chief engineer in administering the Kansas water appropriation act shall be the codes specified in this document. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-709; effective Sept. 22, 2000; amended, T-5-8-23-04, Aug. 23, 2004; amended Nov. 29, 2004.)

5-3-5. Approval of application. The approval of an application on the prescribed form shall constitute a permit to proceed with the construction of authorized diversion works and the diversion and use of water.

The applicant shall be notified of the approval of the application by transmitting to him or her the original document setting forth the terms, conditions, and limitations of the permit which has been duly dated and signed by the chief engineer or his or her authorized representative. A copy of the approval of application and permit to proceed shall be maintained in the office of the chief engineer or the appropriate field office. (Authorized by K.S.A. 82a-706a; modified, L. 1978, ch. 460, May 1, 1978.)

5-3-5a. Authorization for the use of water for emergency purposes. The chief engineer, or a person designated by the chief engineer, may authorize the use of water for emergency purposes. The emergency approval shall be subject to the terms, conditions and limitations specified by the chief engineer and may be granted when determined to be in the public interest or when needed to protect the quality of a water supply, to provide fire protection, or to provide an alternate point of diversion or source of supply when the principal source of supply or point of diversion is unavailable due to conditions beyond the control of the applicant. (Authorized by K.S.A. 82a-706a, 82a-711; effective May 1, 1980.)

5-3-5b. Approval of application for water for the development of underground storage in mineralized formations. In any case where it is not technologically and economically feasible to utilize poorer quality water for the development of underground storage in mineralized formations and fresh water must be used, the chief engineer shall require the construction of surface brine storage facilities to the extent economically and technologically feasible in an amount not to exceed forty percent (40%) of underground storage capacity of the applicant. This regulation does not exempt a person from complying with the requirements of other state and federal agencies relative to the construction of surface brine storage facilities. (Authorized by K.S.A. 82a-706a, 82a-707(d); effective May 1, 1980.)

5-3-5c. Check valves. (a) All diversion works not subject to regulation under the Kansas chemigation safety law, K.S.A. 2-3301 et seq. and amendments thereto, into which any type of chemical or other foreign substances will be injected into the water pumped from the diversion works shall be equipped with an in-line, automatic, quick-closing check valve capable of preventing pollution of the source of the water supply.

(b) Each check valve required by the chief engineer shall be constructed and installed in accordance with the requirements specified in K.A.R. 5-6-13a.

(c) Each check valve and all required components shall be maintained in an operating condition that prevents backflow into the source of water supply whenever a foreign substance could reasonably be expected to be introduced into the water system. (Authorized by K.S.A. 82a-706a;

implementing K.S.A. 82a-706, K.S.A. 82a-706a, K.S.A. 82a-712; effective May 1, 1980; amended May 1, 1981; amended Oct. 24, 2003.)

5-3-5d. Persons required to install a water level measurement tube. Every well with an authorized maximum rate of diversion of 100 or more gallons per minute drilled after the effective date of this regulation, except those wells authorized under a temporary permit, a domestic right, or a term permit for five or fewer years, shall have a tube installed in accordance with specifications adopted by the chief engineer. This tube shall be suitable for making water level measurements and shall be maintained in a satisfactory condition. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706c; effective May 1, 1980; amended Sept. 22, 2000.)

5-3-5e. Meters and other water-measuring devices; reporting readings; maintenance, and replacement. (a) For the purpose of this regulation, "meter" shall mean a water flowmeter or other water-measuring device.

(b) Whenever the installation of a meter is required by the chief engineer as a condition of a water right or permit, by written order of the chief engineer, or by requirement of a groundwater management district, the water right owner shall report all information required on the form prescribed by the chief engineer pursuant to K.S.A. 82a-732, and amendments thereto, including the following:

(1) The beginning and ending readings of the meter each calendar year;

(2) the units in which the meter registers; and

(3) the quantity of water diverted during the calendar year in the same units in which the meter registers.

(c) Whenever a totalizing hour meter has been required by the chief engineer or a groundwater management district, the water right owner shall report all information required on the form prescribed by the chief engineer pursuant to K.S.A. 82a-732, and amendments thereto, including the following:

(1) The beginning and ending readings of the meter each calendar year;

(2) the units in which the meter registers; and

(3) the rate of diversion at which water is pumped in gallons per minute. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-732; effective May 31, 1994; amended Sept. 22, 2000.)

5-3-5g. Designation of a water use correspondent. If the owner or owners of an approval of application or a water right desire to delegate the authority to receive and submit the annual water use reports as prescribed by K.S.A. 82a-732, and amendments thereto, to another person, an owner of the approval of application or the water right shall sign and submit a form prescribed by the chief engineer designating the person responsible to receive and submit the required annual water use report. However, the water right owner or owners shall remain, in all cases, the person or persons legally responsible for filing the water use reports required by K.S.A. 82a-732, and amendments thereto. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-732; effective Sept. 22, 2000.)

5-3-5h. Water conservation plans. Each water conservation plan shall be submitted on a form prescribed by the chief engineer. The plan shall also contain the name, address, and telephone number of the designer of the water conservation plan. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-733; effective Sept. 22, 2000.)

5-3-5i. Time limit to implement a water conservation plan. (a) The time to fully implement the water conservation plan shall be limited by the chief engineer to a reasonable specific date, which may be extended for good cause shown by the applicant.

(b) A municipal or industrial water user shall be given at least one full calendar year after the conservation plan is approved by the chief engineer to fully implement the water conservation plan.

(c) A user of water for irrigation shall be given at least one full growing season after the conservation plan is approved by the chief engineer to fully implement the approved water conservation plan. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-733; effective Sept. 22, 2000.)

5-3-5j. Maintenance of a water conservation plan. Once implemented, the applicant shall continue to satisfactorily maintain each component of the water conservation plan. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-733; effective Sept. 22, 2000.)

5-3-5k. Review of a water conservation plan. The right to review the water conservation plan to determine if it is consistent with current guidelines adopted and maintained pursuant to

K.S.A. 74-2608, and amendments thereto, shall be reserved by the chief engineer. If the review determines that the water conservation plan is materially different from those guidelines, then the owner of the water right or approval of application may be ordered by the chief engineer to amend the water conservation plan to make it consistent with the current guidelines for conservation plans and practices adopted and maintained pursuant to K.S.A. 74-2608, and amendments thereto. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-733; effective Sept. 22, 2000.)

5-3-5*l*. Changes in a water conservation plan. If a person required to implement a water conservation plan desires to make a material change in the plan, that person shall submit a request to make the change to the chief engineer on a form prescribed by the chief engineer. Any material change in an approved water conservation plan shall require the prior written approval of the chief engineer. Any proposed change in a water conservation plan shall be subject to the same type of review as that required for the original water conservation plan. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-733; effective Sept. 22, 2000.)

5-3-5m. Limited power of attorney. If all of the owners of an approval of application or water right desire to authorize any other person to take any type, or types, of official action on behalf of the approval of application or water right, all of the owners of the approval of application or water right shall meet the following requirements:

(a) A limited power of attorney shall be submitted to the chief engineer.

(b) The limited power of attorney shall be signed and acknowledged by all of the owners of the approval of application or water right and filed pursuant to the provisions of K.S.A. 58-601, and amendments thereto. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706a and K.S.A. 82a-701 et seq.; effective Sept. 22, 2000.)

5-3-5n. Authorized place of use. (a) Except as set forth in subsection (b), each approval of application, or an approval of an application for change filed in accordance with K.S.A. 82a-708b, and amendments thereto, shall describe the authorized place of use as either of the following:

(1) Land not authorized for beneficial use of water by any other water right or approval of application; or

(2) exactly the same land authorized for beneficial use of water by one or more prior approvals of applications or water rights.

(b) The requirement in subsection (a) shall not apply to applications that propose to partially overlap the authorized place of use with any of the following:

(1) A municipality;

(2) an irrigation district;

(3) an irrigation ditch company;

(4) a rural water district;

(5) another authorized place of use that cannot all be physically served by all of the water rights and approvals of applications;

(6) an authorized place of use that is owned by different landowners who do not operate together; or

(7) the owner or owners of the water rights and approvals of applications demonstrate both of the following to the chief engineer:

(A) It is not practical or desirable to have a complete overlap.

(B) Allowing an incomplete overlap of authorized places of use will not prejudicially and unreasonably affect the public interest. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-709; effective Sept. 22, 2000.)

5-3-5o. Amending water use reports. (a) Except as specified in this subsection, each annual water use report submitted to the chief engineer pursuant to K.S.A. 82a-732, and amendments thereto, shall be considered the official report of water use information filed in the office of the chief engineer. Each person who files a request to correct a water use report shall ensure that the water use report is corrected in accordance with all of the following procedures, in order for the corrected report to be considered the official report:

(1) A written request to correct the report is submitted to the chief engineer on a form prescribed by the chief engineer.

(2) Each requested change in the water use report is documented by independent, verifiable supporting information, including fuel records, power records, crop production records, county appraiser records, natural resource conservation service records, crop insurance records, other similar types of records, and any combination of these records. The independent, verifiable supporting information may be supported by an affidavit from one or more competent, disinterested

persons who have actual personal knowledge of the facts.

(3) The written request, including the supporting documentation, is verified upon oath or affirmation to be accurate and complete to the best knowledge of the person filing the request.

(4) The person filing the request to change a water use report sustains the burden to show the following:

(A) How the water use report on file in the office of the chief engineer is erroneous or incomplete; and

(B) that the proposed changes are the most complete and accurate water use information available.

(b) The right to perform the following shall be reserved by the chief engineer:

(1) Contest the accuracy and completeness of any water use report filed with the chief engineer, or corrected in accordance with this regulation, to show that the water use report is inaccurate, incomplete, false, or fraudulent; and

(2) make a determination of the actual water use based on the best available information. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706a and K.S.A. 82a-732; effective Aug. 13, 2004.)

5-3-6. Forfeiture, revocation and dismissal. Failure of the applicant or his or her successors to comply with the provisions of the approval of application and permit to proceed and its terms, conditions and limitations without good cause shall result in the forfeiture of the priority date, revocation of the permit and dismissal of the application. (Authorized by K.S.A. 82a-706a; modified, L. 1978, ch. 460, May 1, 1978.)

5-3-6a. Sealing pumps. If the chief engineer, or any of his or her duly authorized representatives, has reasonable cause to believe that any person has failed to obey an order of the chief engineer to cease and desist from operating a pump or other diversion device, the chief engineer or his or her duly authorized representative shall place a seal, or chain and padlock, on the pump or device in such a manner as to render the pump or other diversion device inoperable.

If the seal, or chain and padlock, is broken without the written permission of the chief engineer, this shall create a rebuttable presumption that the pump had been unlawfully operated in violation of the order of the chief engineer and that the water right holder has been acting in violation of the conditions of his or her permit to appropriate water for beneficial use.

The suspected violator shall be informed in writing of the creation of this presumption at the time the seal, or chain and padlock, is installed on the pump or other diversion device. (Authorized by K.S.A. 82a-706a, 82a-706b; effective May 1, 1980.)

5-3-7. Request for extension of time. (a) For applications filed after May 1, 1978, any request for extension of time either for completion of diversion works or for perfecting the appropriation shall be submitted to the chief engineer before the expiration of the time allowed for completing the diversion works or perfecting the appropriation. The request shall be signed by the holder of the approval of application and permit to proceed, by the owner of the land to be irrigated, by an authorized official of a municipality, corporation or partnership, or by any other person that has a recognized interest in the appropriation. Failure to request an extension of time to perfect the appropriation within the time allowed shall limit the water appropriation right to the extent perfected in accordance with the terms, conditions, and limitations set forth in the approval of application.

(b) The request for an extension of time either for completion of diversion works or for perfecting the appropriation shall be accompanied by the statutorily required filing fee and shall include the following information:

(1) The application number;

(2) the date by which the diversion works will be completed or the appropriation will be perfected;

(3) the progress that has been made toward completing the diversion works or perfecting the appropriation;

(4) if for irrigation, the number of acres of land to which water has been applied during one calendar year;

(5) the reason why the diversion works have not been completed or the appropriation has not been perfected; and

(6) the plans for completing the diversion works or perfecting the appropriation. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-714(e); modified, L. 1978, ch. 460, May 1, 1978; amended Oct. 24, 2003.)

5-3-8. Certificate of appropriation. Upon

determination that the appropriation diversion works have been completed and an appropriation right perfected in conformity with an approved application and plans, the chief engineer shall issue a certificate of appropriation setting forth the extent to which the appropriation right was perfected. No appropriation shall be determined for a quantity of water or a diversion rate in excess of that set forth in the approval of application and permit to proceed or in excess of that found to have been actually applied to the approved beneficial use or for any quantity of water found to have been wasted during the calendar year of record used as the basis for perfecting the appropriation right. (Authorized by K.S.A. 82a-706a; modified, L. 1978, ch. 460, May 1, 1978.)

5-3-9. Public interest. (a) In accordance with K.S.A. 82a-711(b)(5), as amended, in ascertaining whether a proposed use will prejudicially and unreasonably affect the public interest, the chief engineer shall also take into consideration the quantity, rate and availability of water necessary to:

(1) satisfy senior domestic water rights from the stream;

(2) protect senior water rights from being impaired by the unreasonable concentration of naturally occurring contaminants; and

(3) over the long term reasonably recharge the alluvium or other aquifers hydraulically connected to the stream.

(b) Unless otherwise provided by regulation, it shall be considered to be in the public interest that only the safe yield of any source of water supply, including hydraulically connected sources of water supply, shall be appropriated. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 1993 Supp. 82a-711; effective Nov. 28, 1994.)

5-3-10. Availability of water for appropriation - safe yield. (a) Except as set forth in subsection (b) and K.A.R. 5-3-16 and K.A.R. 5-3-17, the approval of any new application to appropriate groundwater or surface water for beneficial use, except for domestic use, temporary use and term permits for five years or less, shall not cause the safe yield of the source of water supply to be exceeded, neither shall it otherwise prejudicially and unreasonably affect the public interest. The approval of term permits shall not allow impairment nor prejudicially and unreasonably affect the public interest.

(b) This regulation shall not apply to an application which proposes:

(1) to divert water from a source of water supply subject to a different safe yield, allowable appropriation, depletion or other similar type of criteria adopted by rule and regulation of the chief engineer or intensive groundwater use control area order of the chief engineer issued pursuant to K.S.A. 82a-1036 et seq., or

(2) to use water in a manner so that there is no significant net consumptive use of the local source of supply either in quantity or availability of water for use by other appropriators.

(c) If a total quantity of water that is available for appropriation in any basin, subbasin, stream reach or other hydrologic unit has been determined by the chief engineer prior to the date that application is filed, the total quantity of water authorized by vested rights, prior appropriations, requests by prior unapproved applications and the proposed appropriation shall be determined by the chief engineer.

(1) If the total quantity of water authorized and requested by applications with earlier filing dates is less than or equal to the total annual quantity of water determined to be available for appropriation, or if no total quantity of water available was determined by the chief engineer prior to the date the application was filed, the following procedures shall be used by the chief engineer to further evaluate the applications:

(A) K.A.R. 5-3-11 shall be used to evaluate an application to appropriate groundwater from an unconfined aquifer;

(B) K.A.R. 5-3-14 shall be used to evaluate an application to appropriate groundwater from a confined aquifer; or

(C) K.A.R. 5-3-15 shall be used to evaluate an application to appropriate surface water.

(2) If the total quantity of water authorized and requested exceeds the limit determined by the chief engineer pursuant to this subsection, the application shall be denied or considered only for the quantity available. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 1993 Supp. 82a-711; effective Nov. 28, 1994.)

5-3-11. Availability of water for appropriation-safe yield; unconfined groundwater aquifers. (a) Each application to appropriate groundwater from an unconfined aquifer shall be processed in accordance with this regulation.

(b) To determine the safe yield available for ap-

propriation from an unconfined aquifer at a specific location, the following procedure shall be used by the chief engineer:

(1) The amount of calculated recharge occurring within the area of consideration shall be determined by the chief engineer.

(2) That amount shall be multiplied by the percent of calculated recharge determined by the chief engineer to be available nondomestic groundwater and surface water for appropriation.

(3) The total quantity of water authorized and requested in the same area of consideration shall be subtracted from the number derived from paragraph (b)(2) above. If a water right or permit authorizes more than one point of diversion and not all of them are within the area of consideration, the authorized quantity shall be divided equally between or among all the points of diversion, unless information is available to more accurately distribute the authorized quantity between or among the multiple points of diversion.

(c) (1) If the quantity of water remaining is sufficient to satisfy the proposed application, then the safe yield criteria shall be deemed to have been met, unless there are other relevant factors that need to be taken into account in order to protect the public interest. The application shall then be processed according to other criteria in effect in that area.

(2) If there is sufficient water available to reasonably satisfy part of the request, then the application shall be approved for the quantity available if the remaining quantity is reasonable for the proposed use and the application meets the other applicable criteria in that area.

(3) If no water is available to satisfy the proposed application, then the application shall be denied by the chief engineer.

(d)(1) In making a safe yield calculation, unless the context clearly requires otherwise, the following words and phrases shall have the meanings ascribed to them:

(A) "Circle" means a circle with a two-mile radius, with the proposed point of diversion as the center.

(B) "Area of consideration" means the portion of the two-mile circle located within the limits of the unconfined aquifer expressed in acres, including any area of the circle located within the boundaries of a groundwater management district. The area of consideration shall not include any portion of the circle located outside the state of Kansas.

(C) "Total quantity of water" means the total combined authorized annual quantities under all groundwater rights and approvals of applications, and requested by pending applications with a senior priority in that unconfined aquifer except for domestic use, temporary permits, and term permits for five or fewer years with priority dates senior to the proposed application and with points of diversion located within the area of consideration.

(D) "Calculated recharge" means that portion of the average annual precipitation that becomes recharge to the unconfined aquifer, calculated using the data shown on water resources investigations report 87-4230, plate no. 4, dated 1987, prepared by the United States geological survey, hereby adopted by reference, interpolated to the nearest tenth of an inch, unless better or more specific recharge data for the area of consideration, basin, or aquifer is supplied by the applicant or is already available to the chief engineer.

(2) The calculated recharge in the Kansas river alluvium shall be determined by taking 25% of the average annual rainfall in the area of consideration as taken from figure 2, United States geological survey water resources investigation report 92-4137, dated 1993, hereby adopted by reference, interpolated to the nearest 0.1 of an inch.

(3) For each application to appropriate groundwater from an unconfined aquifer filed on or after the effective date of this regulation, the percentages of calculated recharge that shall be considered to be available for appropriation shall be determined using the following table:

Percent of Calculated Recharge Available for Appropriation	River Basin
(A) 100% plus the recharge from the Missouri River available to the well, as calculated by a Jenkins or similar stream-depletion technique.	Missouri
(B) 100%	Arkansas River below Hutchinson*
	Big Blue River **
	Black Vermillion River **
	Delaware River **
	Little Arkansas River below GMD No. 2 *
	Little Blue River **
	Little Osage River **
	Lower Republican River Basin outside the effective alluvium and the Belleville formation that does not contribute significant baseflow to a stream**

Percent of Calculated Recharge Available for Appropriation	River Basin
	Marais des Cygnes River **
	Mill Creek **
	Marmaton River **
	Nemaha River **
	Pottawatomie Creek **
	Smoky Hill River below its confluence with the Saline River **
	Spring River *
	Stranger Creek **
	Sugar Creek **
	Vermillion Creek **
	Wakarusa River **
	Walnut River *
	Any hydrologic unit that does not contribute significant baseflow to a stream.
(C) 75%	Any hydrologic units in the following river basins that contribute significant baseflow to a stream:
	Arkansas River above Hutchinson*
	Caney River *
	Cottonwood River *
	Cow Creek outside the boundaries of GMD No. 2 and GMD No. 5*
	Elk River *
	Fall River *
	Kansas River **
	Little Arkansas River above GMD No. 2 *
	Lower Republican River Basin outside the effective alluvium and the Belleville formation that contributes significant baseflow to a stream. **
	Neosho River *
	Ninnescah River *
	Saline River **
	Salt Creek **
	Smoky Hill above its confluence with the Saline River **

Percent of Calculated Recharge Available for Appropriation	River Basin
	Solomon River **
	South Fork Ninnescah River (except Smoots Creek) *
	Upper Republican Basin outside areas closed to new appropriations as set forth in paragraph (d)(5) of this regulation. **
	Verdigris River *
	Any other basin in Kansas not specifically identified
(D) 50%	Any hydrologic units in the following river basins that contribute significant baseflow to a stream:
	Bluff Creek-Chikaskia River *
	Bluff Creek-Cimarron River *
	Chikaskia River *
	Cimarron River outside GMD No. 3 *
	Medicine Lodge River *
	North Fork Ninnescah River *
	Rattlesnake Creek *
	Salt Fork Arkansas River *
	Sandy Creek *
	South Fork Ninnescah River (Smoots Creek only) *

* Located in Arkansas River Basin
** Located in Kansas River Basin

(4) The total quantity of water and the percent of calculated recharge originally available to be appropriated for nondomestic groundwater and surface water use in all or part of the following basins, subbasins, stream reaches, and other hydrologic units identified in electronic data file unitbsn.e00, dated July 30, 1997, prepared by the division of water resources, Kansas department of agriculture and hereby adopted by reference for the purpose of defining the boundaries of the hydrologic units, shall be determined using the following table:

South-Central Kansas Designated Unit Areas

Map Label	Effective Date	Area (acres)	Recharge Rate (in/yr)	Recharge Quantity (Ac-ft/yr)	Percentage of Recharge to Appropriate	Original Quantities Available (Ac-ft/yr)	General Location (Twp.-Range)	Abbreviation for Portion of Basin or Basins
1	November 28, 1994	32204	1.8	4831	100%	4831	29-12w	Chikaskia
2	November 28, 1994	41426	1.8	6214	100%	6214	30-11w	Chikaskia
3	November 28, 1994	55524	1.8	8329	50%	4164	29-10w	Chikaskia
4	November 28, 1994	43603	1.8	6540	50%	3270	30-10w	Chikaskia
5	November 28, 1994	46828	2.0	7805	50%	3902	31-05w	Chikaskia
6	November 28, 1994	46895	2.5	9770	50%	4885	33-03w	Chikaskia
7	November 28, 1994	37378	3.0	9344	50%	4672	34-02w	Chikaskia

Map Label	Effective Date	Area (acres)	Recharge Rate (in/yr)	Recharge Quantity (Ac-ft/yr)	Percentage of Recharge to Appropriate	Original Quantities Available (Ac-ft/yr)	General Location (Twp.-Range)	Abbreviation for Portion of Basin or Basins
8	November 28, 1994	42210	3.0	10553	50%	5276	33-01w	Chikaskia
9	November 28, 1994	15145	2.0	2524	100%	2524	30-08w	Chikaskia
10	November 28, 1994	6855	2.0	1143	100%	1143	31-06w	Chikaskia
11	November 28, 1994	2824	2.0	471	100%	471	31-06w	Chikaskia
12	November 28, 1994	8548	2.0	1425	100%	1425	31-05w	Chikaskia
13	November 28, 1994	12165	2.0	2027	50%	1014	31-07w	Chikaskia
14	November 28, 1994	27213	2.0	4535	50%	2268	32-05w	Chikaskia
15	November 28, 1994	21101	1.5	2638	50%	1319	31-15w	Medicine Lodge
16	November 28, 1994	7489	1.5	936	50%	468	32-11w	Medicine Lodge
17	November 28, 1994	20516	1.5	2564	50%	1282	33-11w	Medicine Lodge
18	November 28, 1994	34426	1.5	4303	50%	2152	29-19w	Rattlesnake
19	November 28, 1994	25566	1.5	3196	50%	1598	29-18w	Medicine Lodge
20	November 28, 1994	56730	1.8	8509	100%	8509	29-14w	Medicine Lodge
21	November 28, 1994	41800	1.8	6270	50%	3135	30-12w	Medicine Lodge
22	November 28, 1994	15825	1.2	1582	50%	791	30-17w	Medicine Lodge
23	November 28, 1994	59864	1.5	7483	50%	3742	29-16w	Medicine Lodge
24	November 28, 1994	37658	1.5	4707	100%	4707	29-15w	Medicine Lodge
25	November 28, 1994	102144	1.9	16173	75%	12130	28-09w	SF Ninnescah
26	November 28, 1994	10638	2.0	1773	75%	1330	28-07w	SF Ninnescah
27*	Revision	84047	2.0	14008	50%	7004	26-07w	SF Ninnescah
28	November 28, 1994	5196	2.2	953	75%	714	28-04w	SF Ninnescah
29	November 28, 1994	73816	1.9	11688	100%	11688	28-07w	Chik/SFNin/Nin
30	November 28, 1994	38651	2.0	6442	100%	6442	30-05w	Chik/SFNin/Nin/Ark
31	November 28, 1994	5572	2.3	1068	100%	1068	31-04w	Chik/Ark
32	November 28, 1994	21937	2.0	3656	100%	3656	27-07w	SF Ninnescah
33	November 28, 1994	40646	2.5	8468	75%	6351	23-08w	Arkansas
34	November 28, 1994	41974	2.3	8045	75%	6034	24-08w	NF Ninnescah
35	November 28, 1994	3917	2.0	653	75%	490	26-08w	NF Ninnescah
36	November 28, 1994	12106	2.0	2018	75%	1513	27-10w	NF Ninnescah
37	November 28, 1994	8135	2.0	1356	75%	1017	26-08w	NF Ninnescah
38*	Revision	34550	1.2	3455	50%	1728	32-20w	Bluff Creek (Cim)
39	November 28, 1994	21875	1.2	2188	50%	1094	33-20w	Bluff Creek (Cim)
40	November 28, 1994	11466	1.2	1147	50%	573	33-20w	Bluff Creek (Cim)
41	November 28, 1994	8565	1.6	1142	50%	571	34-17w	Salt Fork Arkansas
42	November 28, 1994	3746	1.6	499	50%	250	33-15w	Salt Fork Arkansas
43	November 28, 1994	9763	1.6	1302	50%	651	34-15w	Salt Fork Arkansas
44	November 28, 1994	33060	1.8	4959	100%	4959	31-10w	Sandy Cr
45	November 28, 1994	3922	1.8	588	100%	588	33-09w	Sandy Cr
46	November 28, 1994	26959	1.8	4044	50%	2022	32-10w	Sandy Cr
47	November 28, 1994	41296	1.8	6194	50%	3097	34-09w	Sandy Cr
48	November 28, 1994	36364	1.9	5758	50%	2879	31-08w	Bluff Creek (Chik)
49	November 28, 1994	45511	2.0	7585	50%	3793	32-07w	Bluff Creek (Chik)
50	November 28, 1994	23546	2.3	4513	50%	2257	34-06w	Bluff Creek (Chik)
51	November 28, 1994	25608	2.7	5762	50%	2881	35-03w	Bluff Creek (Chik)
52	November 28, 1994	4460	1.9	706	100%	706	32-09w	Sandy Cr
53	November 28, 1994	17083	2.0	2847	100%	2847	33-08w	Sandy Cr/Bluf (Chik)
54	November 28, 1994	3845	2.0	641	50%	320	32-08w	Sandy Cr/Bluf (Chik)
55	July 5, 1996	3582	1.2	358	50%	179	35-18w	Cimarron
56	July 5, 1996	10967	1.2	1097	50%	548	35-19w	Cimarron
57	July 5, 1996	37387	1.2	3739	50%	1869	34-20w	Cimarron
58	July 5, 1996	3379	1.3	366	50%	183	33-21w	Cimarron
59	July 5, 1996	5885	1.3	638	50%	319	35-22w	Cimarron
60	July 5, 1996	14854	1.3	1609	50%	805	33-22w	Cimarron
61	July 5, 1996	34080	1.3	3692	50%	1846	34-22w	Cimarron
62	July 5, 1996	25419	1.3	2754	50%	1377	31-17w	Salt Fork
63	July 5, 1996	29813	1.3	3230	15%	484	32-17w	Salt Fork

Map Label	Effective Date	Area (acres)	Recharge Rate (in/yr)	Recharge Quantity (Ac-ft/yr)	Percentage of Recharge to Appropriate	Original Quantities Available (Ac-ft/yr)	General Location (Twp.-Range)	Abbreviation for Portion of Basin or Basins
64	July 5, 1996	90035	1.3	9754	50%	4877	31-18w	Salt Fork
65	July 5, 1996	35931	1.3	3893	50%	1946	31-19w	Bluff Creek
66	July 5, 1996	100983	1.3	10940	50%	5470	30-20w	Bluff-Rattlesnake
67	July 5, 1996	111132	1.2	11113	50%	5557	30-24w	Bluff-Crooked
68	July 5, 1996	12188	1.2	1219	50%	609	31-23w	Cimarron
69	July 5, 1996	5518	1.2	552	50%	276	31-24w	Cimarron
70	July 5, 1996	32689	1.2	3269	50%	1634	32-25w	Cimarron
71	July 5, 1996	94734	1.3	10263	50%	5131	32-26w	Cim-Crooked
72	July 5, 1996	44833	1.3	4857	50%	2428	33-27w	Cim-Crooked
73	July 5, 1996	50088	1.3	5426	50%	2713	34-27w	Cim-Crooked
74	July 5, 1996	25210	1.3	2731	50%	1366	35-27w	Cim-Crooked
75	July 5, 1996	103816	1.3	11247	50%	5623	34-24w	Cim-Crooked
76	July 5, 1996	23296	1.2	2330	50%	1165	30-22w	Bluff-Rattlesnake
77	July 5, 1996	27666	1.2	2767	50%	1383	32-15w	Salt-Medicine
78	July 5, 1996	5261	1.2	526	100%	526	35-13w	Salt Fork
79	July 5, 1996	8249	1.8	1237	50%	619	31-12w	Medicine

* Revision is effective the date of this regulation.

(5) The following hydrologic units, which have been determined by the chief engineer to be fully appropriated based on the safe yield criteria, shall be closed to further new surface water and groundwater appropriations except for domestic use, temporary permits, and term permits for five years or less:

(A) Big Creek, its tributaries and their valley alluviums, and any other aquifer that has a substantial hydraulic connection to an alluvium;

(B) Beaver Creek and Little Beaver Creek, their tributaries and their alluviums, and any other aquifer that has a substantial hydraulic connection to an alluvium;

(C) North Fork Solomon River, its tributaries and their alluviums, and any other aquifer that has a substantial hydraulic connection to an alluvium;

(D) Prairie Dog Creek, its tributaries and their alluviums, and any other aquifer that has a substantial hydraulic connection to an alluvium;

(E) Sappa Creek, its tributaries and their alluviums, and any other aquifer that has a substantial hydraulic connection to an alluvium;

(F) South Fork of the Solomon River, its tributaries and their alluviums above Glen Elder Dam, and any other aquifer that has a substantial hydraulic connection to an alluvium; and

(G) Walnut Creek, its tributaries and their alluviums, and other hydraulically connected aquifers outside the boundaries of the intensive groundwater use control area created by order of the chief engineer shall be those set forth below:

Section	Township	Range	County
28 through 33	18S	23W	Barton
4 through 10 and 14 through 36	18S	14W	Barton
1 through 36	18S	25W	Barton
3 through 11 and 14 through 23	29S	13W	Barton
1 through 6, 9 through 15, and 22 through 24	29S	14W	Barton
1	19S	15W	Barton
31 through 35	17S	16W	Rush
19 through 36	17S	17W	Rush
19 through 36	17S	18W	Rush
23 through 26 and 31 through 36	17S	19W	Rush
35 and 36	17S	20W	Rush
1 through 36	18S	16W	Rush
1 through 36	18S	17W	Rush
1 through 36	18S	18W	Rush
1 through 36	18S	19W	Rush
1 through 36	18S	20W	Rush
3 through 6	19S	16W	Rush
1 through 6	19S	17W	Rush
1, 2, 11, and 12	19S	20W	Rush
32 through 34	17S	25W	Ness
1 through 36	18S	21W	Ness
1 through 4 and 7 through 36	18S	22W	Ness
19, 25 through 36	18S	23W	Ness
23 through 27, 35, and 36	18S	24W	Ness
1 through 5, 10 through 13, 24, 33, and 34	28S	25W	Ness
4 through 9	19S	21W	Ness
1 through 12, 17 and 18	19S	22W	Ness
1 through 23	19S	23W	Ness
1, 2, and 7 through 29	19S	24W	Ness
1 through 3 and 11 through 13	19S	25W	Ness

(6) "Technical guidelines for determining the availability of groundwater for appropriation in the Lower Republican River Basin and Belleville Formation and the availability of surface water for appropriation in the Lower Republican River Basin," adopted by the chief engineer, division of water resources, Kansas department of agriculture, on October 1, 1999, is hereby adopted by reference as determining the availability of groundwater for appropriation in the lower Republican River basin and Belleville formation and the availability of surface water for appropriation in the lower Republican River basin.

(7) (A) All applications for a permit to appropriate groundwater from the area described in paragraph (7) (B) for any beneficial use, except for domestic use, temporary permits, and short-term permits for five or fewer years, shall be accepted for filing and given a file number, if acceptable for filing. The application shall be returned by the chief engineer, and the reason that the application will be denied shall be specified by the chief engineer. The applicant shall be given 30 days to show cause why the application should not be denied. If the applicant does not show good cause, the application shall be dismissed.

(B) The area is described as sections 17, 18, 19, 20, township 7 south, range 6 west, and sections 13, 14, township 7 south, range 7 west, all in Mitchell County, Kansas.

(C) All applications for permits to appropriate groundwater from sections 29 and 30 in township 7 south, range 6 west, and sections 12, 15, 16, 21, 22, 23, 24, 25, 26, and 27 in township 7 south, range 7 west, all in Mitchell County, Kansas, for any beneficial use, except for domestic use, temporary permits, and term permits for five or fewer years, shall be processed based on the criteria set forth below in paragraph (7) (D).

(D) No new wells shall be allowed in the area described in paragraph (7) (C) above if the proposed well would produce one foot or more of additional drawdown at any existing well in that area and if the proposed well was pumped continuously for 45 days (1,080 hours) at the rate requested on the application. This analysis shall be done by using the Theis equation, with a coefficient of transmissivity of 71,000 gallons per day per foot (gpd/ft) and a coefficient of storage of 0.02.

(E) Any application for a change in the point of diversion filed for a well located in the areas described in paragraphs (7) (B) and (C) above shall be limited to a move of no more than 100 feet, unless the applicant can show the chief engineer that the proposed move will not prejudicially and unreasonably affect the public interest, will not impair existing water rights, and otherwise complies with the provisions of K.S.A. 82a-708b, and amendments thereto. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 1999 Supp. 82a-711; effective Nov. 28, 1994; amended Sept. 22, 2000.)

5-3-12. (Authorized by K.S.A. 82a-701(g), 82a-706a; effective May 1, 1980; revoked May 1, 1987.)

5-3-13. Dewatering of construction sites. The chief engineer shall limit the time in which water may be withdrawn for dewatering purposes. Any water right that may be perfected by the dewatering project shall be deemed abandoned and terminated upon the completion of the dewatering project. Any extension of time in which to complete the project must be requested in writing by the applicant prior to the expiration date on the permit. (Authorized by K.S.A. 82a-706a, 82a-712; effective May 1, 1980.)

5-3-14. Availability of water for appropriation - safe yield; confined groundwater aquifers. (a) Each application to appropriate water from a confined aquifer shall be processed on a case by case basis so that the safe yield of the source of water supply is not exceeded.

(b) Until a specific regulation is adopted by the chief engineer for the confined source of water supply, the analysis shall be made using the best information reasonably available to the chief engineer. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 1993 Supp. 82a-711; effective Nov. 28, 1994.)

5-3-15. Availability of water for appropriation - safe yield; surface water. (a) Each application filed to directly divert the natural flow of the Kansas river, the Missouri river, the Big Blue river, the Spring river, or their tributaries, shall:

(1) be processed in accordance with K.A.R. 5-3-9; and

(2) meet all other requirements for the approval of a new application.

(b) The water right owner shall be required by the chief engineer to meet minimum desirable streamflows (MDS), assurance district target flows (assurance target flows) and division of wa-

ter resources (DWR) target flows where applicable.

(c) Each application filed to directly divert the natural flow from any stream or tributary in the state of Kansas, except those streams listed in paragraph (a) of this regulation, shall have the following conditions of approval.

(1) If MDS or assurance target flows or DWR target flows have been set for that stream, and MDS administration has been requested by the Kansas water office, diversion of natural flow shall only be permitted if MDS, assurance target flows or DWR target flows, if applicable, are being met at the gage or gages immediately below the proposed point of diversion.

(2) Diversion of natural flow shall not take place unless there is water available to satisfy all demands by senior water rights and permits.

(3) The streamflow shall not be stopped at the first riffle below the point of diversion while diversion is taking place under the authority of that water right or permit.

(4) During the period October 1 through June 30, the verbal or written permission of the chief engineer, or an authorized representative of the chief engineer, shall be obtained in order to divert water each time the applicant desires to divert water.

(5) The applicant shall be required to demonstrate that the direct diversion of streamflow is not necessary during the period July 1 through September 30 each calendar year because of lack of need; the availability of adequate water storage or alternative water supplies; or other similar reasons.

(6) During the period July 1 through September 30 each calendar year, no direct diversions of water shall be permitted unless written permission is obtained from the chief engineer or the chief engineer's authorized representative.

(d) Each application filed by a member of an operational assurance district for that stream shall be processed taking into consideration the provisions of the assurance district contract.

(e) Each application filed for a point of diversion which might divert water released from storage pursuant to an agreement between the state of Kansas and the federal government shall be processed taking into consideration the provisions of that agreement.

(f) Each application filed to divert the natural flow of any stream subject to a more specific regulation adopted by the chief engineer or an intensive groundwater use control area order issued by the chief engineer, for a basin or portion thereof, shall be processed in accordance with the provisions of that regulation or order. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 1993 Supp. 82a-711; effective Nov. 28, 1994.)

5-3-16. Safe yield; exemptions for up to 15 acre-feet of groundwater. In any area of the state outside a groundwater management district that is subject to safe yield criteria and is not closed by regulation or intensive groundwater use control area order by the chief engineer to new nondomestic, nontemporary permits and term permits for five or fewer years, applications to appropriate groundwater shall be exempt from meeting the safe yield criteria if the chief engineer finds that all of the following conditions are met:

(a) The sum of the annual quantity requested by the proposed appropriation and the total annual quantities authorized by prior permits allowed because of an exemption pursuant to this regulation does not exceed 15 acre-feet in a ½-mile-radius circle surrounding the proposed point of diversion.

(b) Well spacing criteria in the area have been met.

(c) The approval of the application does not authorize an additional quantity of water out of an existing authorized well with a nondomestic permit or water right, which would result in a total combined annual quantity of water authorized from that well in excess of 15 acre-feet.

(d) All other criteria for processing a new application to appropriate water at that location have been met. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 1999 Supp. 82a-711; effective Nov. 28, 1994; amended Sept. 22, 2000.)

5-3-16a. Closed areas; exemptions for up to five acre-feet of groundwater. In any area of the state that is outside a groundwater management district and an intensive groundwater use control area (IGUCA) and that is closed to new appropriations of groundwater by regulation except for domestic use, temporary permits, and term permits for five or fewer years, applications to appropriate groundwater shall be exempt from meeting the safe yield criteria and the regulation closing the area to new appropriations if the chief engineer finds that all of the following criteria are met: (a) The sum of the annual quantity of water requested by the proposed appropriation and the total annual quantities of water au-

thorized by prior approvals of applications allowed because of an exemption pursuant to this regulation does not exceed five acre-feet in a two-mile-radius circle surrounding the proposed point of diversion.

(b) The annual quantity of water requested is reasonable for the proposed beneficial use of water.

(c) All other criteria for processing a new application to appropriate water at that location, including well spacing criteria, have been met.

(d) The approval of the application does not authorize an additional quantity of water out of an existing well that would result in a total combined annual quantity of water authorized from that well in excess of five acre-feet per calendar year.

(e) The proposed beneficial use of water will significantly benefit the public interest and help maximize economic development. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706a, K.S.A. 2002 Supp. 82a-711, and K.S.A. 2002 Supp. 82a-1904; effective Oct. 24, 2003.)

5-3-17. Safe yield; miscellaneous exemptions. In any area of the state which is subject to safe yield criteria, and outside a groundwater management district or an intensive groundwater use control area closed to new non-domestic, non-temporary uses, each application to appropriate groundwater for a beneficial use shall be exempt from meeting the safe yield criteria if the chief engineer finds that:

(a) the proposed use has occurred continuously since prior to the effective date of this regulation;

(b) the proposed use could have reasonably been classified by the division of water resources as a domestic use at the time the use began; and

(c) all other requirements in effect for the approval of a new application to appropriate water at that location have been met. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 1993 Supp. 82a-711; effective Nov. 28, 1994.)

5-3-18. Applicant's opportunity to submit additional information. (a) If at any stage of processing an application, it is determined by the chief engineer that an application does not meet the safe yield criteria, the applicant shall be notified by the chief engineer in writing prior to denial of the application that the safe yield requirements have not been met and the reason for the proposed denial. In this written notice, the chief engineer shall allow the applicant 15 days to request time in which to submit additional information to show why the application should be approved.

(b) Within 15 days the applicant shall either submit the additional information or file a written request for a reasonable amount of time to submit an engineering report or similar type of hydrologic analysis to show that approval of the application will not cause the safe yield of the source of water supply to be exceeded.

(c) If the applicant fails to timely show to the satisfaction of the chief engineer that the application can be approved, then the application shall be denied by the chief engineer. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 1993 Supp. 82a-711; effective Nov. 28, 1994.)

5-3-19. Maximum reasonable annual quantity of water for irrigation use. (a) For applications filed before the effective date of this regulation, the maximum annual quantity of water reasonably necessary to irrigate crops shall be determined as follows:

(1) In that area of Kansas located between the eastern border of Kansas and the western border of range 6 east, the maximum reasonable annual quantity of water shall not exceed one acre-foot of water per acre irrigated.

(2) In that area of Kansas located between the eastern border of range 5 east and the western border of range 20 west, the maximum reasonable annual quantity of water shall not exceed 1½ acre-feet of water per acre irrigated.

(3) In that area of Kansas located between the eastern border of range 21 west and the western border of Kansas, the maximum reasonable annual quantity of water shall not exceed two acre-feet of water per acre irrigated.

(b) On and after the effective date of this regulation, the maximum annual quantity of water reasonably necessary to irrigate crops shall be determined by multiplying the number of irrigated acres by the county value found on the map adopted by reference in K.A.R. 5-3-24. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706a, K.S.A. 82a-707(e), and K.S.A. 2002 Supp. 82a-711; effective Sept. 22, 2000; amended Oct. 24, 2003.)

5-3-20. Maximum reasonable annual quantity of water approvable for a new appropriation of water for irrigation use. (a) The maximum reasonable annual quantity of water that may be approved for use on irrigated land for

applications filed before the effective date of this regulation shall be limited to the following:

(1) The quantity of water available for appropriation as determined by the safe yield, allowable appropriation or similar type of limitation adopted by regulation of the chief engineer for the area in which the proposed point of diversion will be located;

(2) the quantity of water reasonably physically available from the source of water supply based on the physical characteristics of the source of water supply and the proposed diversion works; and

(3) the quantity of water reasonably necessary to irrigate crops in the region of the state where the proposed place of use is located as set forth in K.A.R. 5-3-19(a). The authorized quantity shall be determined by multiplying the number of acres approved to be irrigated by the quantity per acre set forth in K.A.R. 5-3-19(a).

(b) The maximum reasonable annual quantity of water that may be approved for use on irrigated land for applications filed on or after the effective date of this regulation shall be limited to the following:

(1) The quantity of water available for appropriation as determined by the safe yield, allowable appropriation or similar type of limitation adopted by regulation of the chief engineer for the area in which the proposed point of diversion will be located;

(2) the quantity of water reasonably physically available from the source of water supply based on the physical characteristics of the source of water supply and the proposed diversion works; and

(3) the quantity of water reasonably necessary to irrigate crops in the region of the state where the proposed place of use is located as set forth in K.A.R. 5-3-19(b).

(c) The quantity specified in subsection (a) or (b) may be exceeded only if the applicant demonstrates both of the following to the chief engineer:

(1) Because of specialty crops or other unusual conditions, the quantity specified in K.A.R. 5-3-19 is insufficient.

(2) The requested quantity is reasonable for the intended irrigation use, is not wasteful, and will not otherwise prejudicially and unreasonably affect the public interest. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-707(e), K.S.A. 1999 Supp. 82a-711, and K.S.A. 82a- 712; effective Sept. 22, 2000.)

5-3-21. Perfection of a water right for irrigation use. (a) For applications with a priority date before the effective date of this regulation, the maximum reasonable annual quantity of water that may be perfected for irrigation use shall not exceed the following:

(1) The maximum annual quantity of water actually applied to beneficial use in any one calendar year in accordance with the terms, conditions, and limitations of the approval of application during the perfection period; and

(2) the quantity of water reasonably necessary to irrigate crops in the region of the state where the place of use is located as set forth in K.A.R. 5-3-19(a). The reasonable quantity shall be determined by multiplying the number of acres actually irrigated during the year of record by the quantity per acre as set forth in K.A.R. 5-3-19(a).

(b) For applications with a priority date on or after the effective date of this regulation, the maximum reasonable annual quantity of water that may be perfected for irrigation use shall not exceed the following:

(1) The maximum annual quantity of water actually applied to beneficial use in any one calendar year in accordance with the terms, conditions, and limitations of the approval of application during the perfection period; and

(2) the quantity of water reasonably necessary to irrigate crops in the region of the state where the place of use is located as set forth in K.A.R. 5-3-19(b). The reasonable quantity shall be determined by multiplying the number of acres actually irrigated during the year of record by the quantity per acre set as forth in K.A.R. 5-3-19(b).

(c) The quantity specified in subsection (a) or (b) may be exceeded only if the water right owner demonstrates both of the following to the chief engineer:

(1) Because of specialty crops or other unusual conditions, the quantity specified in K.A.R. 5-3-19 was insufficient.

(2) A greater quantity was reasonable for the intended irrigation use, was not wasteful, and did not otherwise prejudicially and unreasonably affect the public interest. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-707(e) and K.S.A. 1999 Supp. 82a-714; effective Sept. 22, 2000.)

5-3-22. Maximum reasonable quantity of water for livestock and poultry. (a) The following quantities shall be deemed the maximum

quantity of water reasonable for nondomestic livestock and poultry water use:

Livestock/ poultry	Drinking water (gallons per head per day)	Additional quantities for servicing/flushing (gallons per head per day)
Cattle, beef	15	0 (open lot) 100 [confined building capacity (cbc)]
Cattle, dairy	35	100 (cbc)
Swine		
finishing	5	15 (cbc)
nursery	1	4 (cbc)
sow and litter	8	35 (cbc)
gestating sow	6	25 (cbc)
Sheep	2	0 (open lot) 15 (cbc)
Horses	12	0 (open lot) 100 (cbc)
Poultry		
chickens (100	9	200 (cbc)
layers)	30	400 (cbc)
turkeys (100)		

(b) The maximum reasonable quantity of water that may be approved for nondomestic livestock and poultry use for applications approved on or after the effective date of this regulation shall be limited as set forth in subsection (a) above. The quantities set forth in subsection (a) may be exceeded only if the applicant demonstrates both of the following to the chief engineer:

(1) The requested quantity is reasonable for the intended use.

(2) This quantity is not wasteful and will not otherwise prejudicially and unreasonably affect the public interest.

(c) For all other types of nondomestic livestock, poultry, birds, and animals, the maximum quantity of water approved for beneficial use shall be reasonable.

(d) The maximum reasonable quantity of water that may be perfected for nondomestic livestock or poultry use shall not exceed the quantities set forth in subsections (a), (b) and (c) above, unless the water right owner demonstrates both of the following to the chief engineer:

(1) A larger quantity of water was actually applied to beneficial use within the terms, conditions, and limitations of the permit within the perfection period.

(2) The quantity used was not wasted. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-707(e), K.S.A. 1999 Supp. 82a-711, K.S.A. 82a-712, and K.S.A. 1999 Supp. 82a-714; effective Sept. 22, 2000.)

5-3-23. Maximum reasonable annual quantity approvable for irrigation use for an application for change in place of use and a request to reduce a water right. (a) Except as provided in subsections (c), (d), and (e), for water rights with a priority date before the effective date of this regulation, the maximum reasonable annual quantity of water that may be approved for either of the following shall be that quantity of water reasonably necessary to irrigate crops in the region of the state where the proposed place of use is located as set forth in K.A.R. 5-3-19(a):

(1) An application for change in place of use for irrigation filed pursuant to K.A.R. 82a-708b and amendments thereto; or

(2) a request to reduce the authorized place of use for irrigation for a water right filed pursuant to K.A.R. 5-7-5.

(b) Except as provided in subsections (c), (d), and (e), for water rights with a priority date on or after the effective date of this regulation, the maximum reasonable annual quantity of water that may be approved for either of the following shall be that quantity of water reasonably necessary to irrigate crops in the region of the state where the proposed place of use is located as set forth in K.A.R. 5-3-19(b):

(1) An application for change in place of use for irrigation filed pursuant to K.A.R. 82a-708b and amendments thereto; or

(2) a request to reduce the authorized place of use for a water right filed pursuant to K.A.R. 5-7-5.

(c) The maximum reasonable quantities approvable in subsections (a) and (b) above shall not exceed either of the following:

(1) The applicable quantity set forth in either subsection (a) or (b) above; or

(2) the maximum quantity of acre-feet per acre authorized by the vested water right or certificate of appropriation, whichever is greater. The maximum authorized quantity of acre-feet per acre shall be calculated by dividing the maximum annual quantity of water authorized at the time the application for change or request to reduce is filed by the number of acres authorized at the time the application for change is filed.

(d) The quantities set forth above in subsections (a), (b), and (c) above may be exceeded only if the

applicant demonstrates both of the following to the chief engineer:

(1) Because of specialty crops or other unusual conditions, the quantity specified in K.A.R. 5-3-19(a) is insufficient.

(2) The requested quantity is reasonable for the intended irrigation use, is not wasteful, and will not otherwise prejudicially and unreasonably affect the public interest.

(e) The maximum annual quantity of water approved pursuant to this regulation shall not exceed the maximum annual quantity of water authorized by the water right at the time the change application is approved. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-707(e) and K.S.A. 1999 Supp. 82a-708b; effective Sept. 22, 2000.)

5-3-24. Reasonable quantity for irrigation use. The Kansas department of agriculture, division of water resources' map titled "reasonable quantities for irrigation use in Kansas, by county," dated October 21, 1999, is hereby adopted by reference. (Authorized by K.S.A. 82a- 706a; implementing K.S.A. 82a-707(e), K.S.A. 1999 Supp. 82a-711, and K.S.A. 1999 Supp. 82a-714; effective Sept. 22, 2000.)

5-3-25. Conditions on permits and certificates. (a) All terms, conditions, and limitations placed on an approval of application by the chief engineer pursuant to the provisions of K.S.A. 82a-712, and amendments thereto, shall remain in full force and effect until expressly modified or removed by the chief engineer.

(b) Unless the terms and conditions are expressly modified or removed by the subsequent approval, certification, or other order of the chief engineer, none of the following shall modify or remove any of the terms, conditions, and limitations placed on the original approval of applications or water right:

(1) The approval of an application to change the place of use, the point of diversion, or the use made of water under the authority of K.S.A. 82a-708b and amendments thereto;

(2) the issuance of a certificate of appropriation pursuant to K.S.A. 82a-714 and amendments thereto; or

(3) the issuance of any other findings and order relative to the approval of application or water right. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 1999 Supp. 82a-708b, K.S.A. 1999 Supp. 82a-711, K.S.A. 82a-712, and K.S.A. 1999 Supp. 82a-714; effective Sept. 22, 2000.)

5-3-26. Closed townships in Pawnee and Buckner drainage basins in Pawnee, Hodgeman, Ness, and Finney counties. (a) Except as specified in subsection (c), the following townships in the Pawnee and Buckner drainage basins shall be closed to new appropriations of water:

(1) T 20 S:

(A) R 19 W through R 26 W;

(B) R 18 W, section 7 and sections 17 through 36; and

(C) R 17 W, section 31;

(2) T 21 S:

(A) R 30 W, sections 1 through 4, 9 through 16, 21 through 28, and 33 through 36;

(B) R 21 W through R 29 W;

(C) R 20 W and R 19 W, sections 1 through 6; and

(D) R 18 W, sections 1 through 24;

(3) T 22 S:

(A) R 30 W, sections 1 through 4, 9 through 16, 21 through 28, and 33 through 36;

(B) R 21 W through R 29 W;

(C) R 19 W and R 20 W, sections 13 through 36;

(D) R 18 W, sections 20 through 36; and

(E) R 17 W, sections 20, 21, and 30;

(4) T 23 S:

(A) R 22 W through R 26 W;

(B) R 21 W, sections 1 through 24, and 27 through 32;

(C) R 20 W, sections 1 through 18;

(D) R 19 W, sections 1 through 12 and 14 through 18; and

(E) R 18 W, sections 3 through 10; and

(5) T 24 S:

(A) R 23 W through R 26 W;

(B) R 22 W, sections 1 through 23 and 26 through 35; and

(C) R 21 W, sections 5, 6, and 7.

(b) Except as specified in subsection (c), all new applications that propose a point of diversion in any of the areas described in subsection (a) that are pending approval on the effective date of this regulation shall be dismissed.

(c) The closure of the townships listed in subsection (a) to new appropriations of water shall not apply to the following types of wells:

(1) Wells for domestic use;

(2) wells authorized by temporary permits; and

(3) wells authorized by term permits of fewer than five years.

This regulation shall be effective on and after October 25, 2002. (Authorized by K.S.A. 82a-

706a; implementing K.S.A. 2001 Supp. 82a-711 and K.S.A. 82a-721; effective Sept. 22, 2000; amended, T-5-6-27-02, June 27, 2002; amended Oct. 25, 2002.)

5-3-27. Equus Beds special groundwater quality area. (a) A special groundwater quality area located within the boundaries of the Equus Beds groundwater management district no. 2 shall be hereby established in the following area consisting of approximately 36 square miles in northwest Harvey County, south-central McPherson County, and northeast Reno County, Kansas:

(1) Sections 3 through 10, 15 through 22, and 27 through 34, of township 22 south, range 3 west, Harvey County;

(2) sections 31 through 34, township 21 south, range 3 west, and section 36, township 21 south, range 4 west, McPherson County; and

(3) sections 1, 12, 13, 25, 26, and 36, township 22 south, range 4 west, Reno County, Kansas.

(b) Each application for a new appropriation of groundwater, a newly constructed well, or a change in the point of diversion for a well within the area shall be reviewed by the chief engineer to determine the effect of the proposed appropriation or well on the movement of saltwater pollution in the area.

(c) A test well log shall accompany each type of application described in subsection (b) within the area described in subsection (a) above and shall include the following information:

(1) Depth to bedrock;

(2) a water quality analysis of water taken from the bottom 20 feet of the aquifer, including sodium and chloride concentrations; and

(3) a water quality analysis of water taken within the top 20 feet of the aquifer, including specific conductance and chloride concentrations.

(d) If the chief engineer can not determine whether the proposed application will affect the movement of saltwater pollution in the area in a manner that is adverse to the public interest or that will cause impairment to other water rights by causing an unreasonable deterioration of the water quality, then the applicant shall submit any information the chief engineer needs to make that determination. The information shall be submitted within a reasonable time period specified by the chief engineer.

(e) The chief engineer shall submit the proposed application to the board of the Equus Beds groundwater management district no. 2 for its review and recommendation. The board shall have 30 days to review the application and provide its recommendation to the chief engineer. The recommendation of the board shall be considered by the chief engineer in making a decision as to whether the application can be approved as filed or modified.

(f) The application shall be dismissed and its priority forfeited if either of the following conditions is met:

(1) The chief engineer determines that approval of the application will affect the movement of saltwater pollution in the area in a manner that will prejudicially and unreasonably affect the public interest or that will cause impairment to other water rights by causing an unreasonable deterioration of the water quality because of saltwater pollution.

(2) The applicant fails to submit the information requested by the chief engineer within the time specified.

(g) The application shall be approved if both of the following conditions are met:

(1) The chief engineer determines that the approval of the application, as filed or modified, will not affect the movement of saltwater pollution in the area in a manner that is adverse to the public interest and will not cause impairment to other water rights by causing an unreasonable deterioration of the water quality because of saltwater pollution.

(2) The application meets all other statutory and regulatory criteria.

(h) In addition to reporting the information normally required in the water use reports required by K.S.A. 82a-732, and amendments thereto, each owner of a water right or approval of application shall also report the depth to the static water level in each well, in a manner acceptable to the chief engineer.

(i) All groundwater diversion works permitted in the Equus Beds special groundwater quality area shall be equipped with a water flowmeter that meets the specifications adopted by the chief engineer, except for domestic wells, temporary wells, and wells authorized by term permits for fewer than five years. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706c, K.S.A. 82a-709, K.S.A. 82a-710, K.S.A. 1999 Supp. 82a-711, and K.S.A. 82a-732; effective Sept. 22, 2000.)

5-3-28. Lyons special groundwater quality area. (a) A special groundwater quality area

all in Rice County, Kansas, and partially located within the boundaries of the Big Bend groundwater management district no. 5 shall be hereby established in the following described area consisting of approximately 37 square miles in central Rice County, Kansas:

(1) Sections 33, 34, and 35 of township 19 south, range 8 west;

(2) sections 1-4, 9-16, 21-25, township 20 south, range 8 west;

(3) sections 7, 17-21, 27-34, township 20 south, range 7 west; and

(4) sections 3-5, township 21 south, range 7 west.

(b) Each application for a new appropriation of groundwater, a newly constructed well, or a change in point of diversion for a well proposed to be located within the area shall be reviewed by the chief engineer to determine whether the proposed appropriation will have any adverse effect on the movement and remediation of saltwater pollution south and east of Lyons, Kansas.

(c) A test well log shall accompany each type of application filed for a point of diversion described in subsection (b) that is proposed to be located within the area described in subsection (a), and shall include the following information:

(1) Depth to bedrock;

(2) a water quality analysis of water taken from the bottom 20 feet of the aquifer, including analysis of sodium and chloride concentrations; and

(3) a water quality analysis of water taken within the top 20 feet of the aquifer, including analysis of sodium and chloride concentrations.

(d) If the chief engineer can not determine whether the proposed application will affect the movement and cleanup of saltwater pollution south and east of Lyons in a manner that is adverse to the public interest or that will cause impairment to other water rights by causing an unreasonable deterioration of the water quality, then the applicant shall submit any information the chief engineer needs to make that determination. The information shall be submitted within a reasonable time period specified by the chief engineer.

(e) If the proposed point of diversion is located within the district, the proposed application shall be submitted by the chief engineer to the board of the district for review and recommendation. The board shall have 30 days to review the application and submit its recommendation to the chief engineer. The recommendation of the board shall be considered by the chief engineer in making a decision as to whether the application can be approved as filed or modified.

(f) The application shall be dismissed and its priority forfeited if either of the following conditions is met:

(1) The chief engineer determines that approval of the application will affect the movement and cleanup of saltwater pollution south and east of Lyons in a manner that prejudicially and unreasonably affects the public interest or that will cause impairment to other water rights by causing an unreasonable deterioration of the water quality because of saltwater pollution.

(2) The applicant fails to submit the information requested by the chief engineer within the time specified.

(g) The application shall be approved if both of the following conditions are met:

(1) The chief engineer determines that the approval of the application, as filed or modified, will not affect the movement and cleanup of saltwater pollution south and east of Lyons in a manner that would prejudicially and unreasonably affect the public interest and will not cause impairment to other water rights by causing an unreasonable deterioration of the water quality because of saltwater pollution.

(2) The application meets all other applicable statutory and regulatory criteria. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706c, K.S.A. 82a-709, K.S.A. 82a-710, K.S.A. 1999 Supp. 82a-711, and K.S.A. 82a-732; effective Sept. 22, 2000.)

5-3-29. Ozark and Springfield plateau aquifers. (a) Except as specified in subsections (b) and (c), the Ozark aquifer and the Springfield plateau aquifer in the following townships in Cherokee, Crawford, Allen, Bourbon, Neosho, and Labette counties in Kansas shall be closed to new appropriations of water: ranges 20 east through 25 east and townships 26 south through 35 south.

(b) The closure of townships listed in subsection (a) to new appropriations of water shall not apply to the following types of wells:

(1) Wells for domestic use;

(2) wells authorized by temporary permits;

(3) wells meeting the requirements of K.A.R. 5-3-16a; and

(4) wells meeting both of the following conditions:

(A) Are authorized by a term permit of five or fewer years, which can be extended by the chief engineer not beyond December 31, 2010, and over which the chief engineer retains jurisdiction to dismiss or amend if necessary to prevent impairment of the water quantity, rate, or quality or to otherwise protect the public interest; and

(B) are used as an alternate source of water supply that is actively being planned, financed, and constructed and that will be available no later than December 31, 2010.

(c) Notwithstanding the provisions of paragraph (b)(4)(A), the term permits may be extended by the chief engineer beyond December 31, 2010 or may be converted by the chief engineer to regular permits to appropriate water, if both of the following conditions are met:

(1) A study has been completed before December 31, 2010, determining the safe yield of the Ozark aquifer and the Springfield plateau aquifer.

(2) Extending the term of the term permit or converting the term permit to a regular permit to appropriate water will not result in any of the following:

(A) Causing the safe yield to be exceeded;

(B) impairing prior permits or water rights; or

(C) prejudicially and unreasonably affecting the public interest. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706a and K.S.A. 2003 Supp. 82a-711; effective, T-5-8-23-04, Aug. 23, 2004; effective Nov. 29, 2004.)

Article 4.—DISTRIBUTION OF WATER BETWEEN USERS

5-4-1. Distribution of water between users where a prior right is being impaired. When a complaint is received that a prior right to the use of water is being impaired, the following procedure shall be followed:

1. The complaint shall be made to the chief engineer or his or her authorized representative. A complaint may be accepted verbally, in person or by telephone. No action shall be taken by the agency until the complaint is confirmed in writing.

2. An investigation of the physical conditions involved shall be made by the chief engineer or his or her authorized representative.

3. A written report of the investigation shall be prepared and a copy given to the complainant. If the investigation shows there is no basis for further action by the division the complainant shall be so advised.

4. The complainant shall make a written request to secure water to satisfy his or her prior right.

5. The chief engineer or his or her authorized representative shall give a written legal notice and directive to other water users whose use of water must be regulated to secure water to satisfy the complainant's prior rights.

The request to secure water shall be made on a prescribed form furnished for that purpose by the division of water resources. All water delivered to the user's point of diversion for his or her use at the specified rate or less shall be applied to the authorized beneficial use and count against the quantity of water specified unless the user notifies the chief engineer or his or her authorized representative that diversion and use will be discontinued for a period of time for good reason.

When the quantity of water needed has been delivered to the user's point of diversion or when the user discontinues his or her use of water, those persons who have been directed to regulate their use shall be notified that they may resume the diversion and use of water.

If the available water supply in the source should increase, the chief engineer or his or her authorized representative may allow some or all of the users regulated to resume use depending on the supply. (Authorized by K.S.A. 82a-706a; modified, L. 1978, ch. 460, May 1, 1978.)

5-4-4. Well spacing. (a) The spacing between wells shall be sufficient to prevent direct impairment between wells located in a common source of supply or hydraulically connected sources of supply and to protect the public interest. Except as set forth in subsection (b), the following guidelines shall be used to determine the spacing required between wells permitted by the chief engineer in a common source of supply, unless it is determined by the chief engineer in any specific instance that the spacing guidelines set forth in this regulation are insufficient to prevent direct impairment or are not necessary to prevent direct impairment.

(b) Whenever an applicant proposes to divert water from a source of supply in a location where there is a significant hydraulic connection between the proposed source of supply and another source or sources of supply, the chief engineer shall determine the spacing necessary to prevent impairment and to protect the public interest on a case by case basis.

(c) Except as set forth in subsection (e) below, each well that is described in an application for a permit to appropriate water for beneficial use or for a term permit, excluding any domestic or temporary well, shall meet the minimum spacing requirements set out in paragraphs (1) and (2) below.

(1) The minimum distance from the well which is the subject of the application to all other senior authorized non-domestic and non-temporary wells in the same aquifer or a hydraulically connected aquifer shall be:

(A) four miles between wells whose common source of supply is the confined Dakota aquifer system;

(B) one-half mile between wells whose common source of supply is the unconfined Dakota aquifer system; and

(C) 1320 feet for wells whose common source of supply is any other aquifer.

(2) In addition to meeting the minimum spacing requirements of paragraph (1) above, the minimum distance from the well which is the subject of the application to all domestic wells, except where the domestic well owner has given the applicant written permission to reduce the spacing interval, shall be:

(A) one-half mile for wells whose common source of supply is the confined Dakota aquifer system;

(B) 1320 feet for wells whose common source of supply is the unconfined Dakota aquifer system; and

(C) 660 feet for wells whose common source of supply is any other aquifer.

(d) Except as provided in subsection (e), the location of a well or wells on an application to change the point of diversion under an existing water right shall either:

(1) meet the spacing requirements in paragraphs (c)(1) and (c)(2) above; or

(2) not decrease the distance to other wells or authorized well locations by more than 300 feet.

(e) This regulation shall not apply if the chief engineer has adopted another regulation, or issued an order pursuant to K.S.A. 82a-1036 *et seq.*, specifying a different well spacing for the source of supply in which the proposed point of diversion is located.

(f) In the case of a battery of wells, the distance shall be measured from the geographic center of the points of diversion comprising the battery.

(g) If the proposed point of diversion does not meet the well spacing requirements in this regulation, the applicant shall be notified by the chief engineer in writing prior to dismissal that the requirements have not been met. The applicant shall then have 15 days to request time in which to submit additional information. Upon written request, the applicant shall be given a specified reasonable amount of time by the chief engineer to submit an engineering or similar type of hydrologic analysis to show that the spacing can be decreased without impairing existing rights or prejudicially and unreasonably affecting the public interest. The burden shall be on the applicant to make such a showing to the satisfaction of the chief engineer. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 1993 Supp. 82a-711; effective May 31, 1994.)

5-4-5. Approval of application for additional rate only. (a) Except as set forth in subsection (c), an application for a permit to appropriate water for beneficial use that requests only an increase in the authorized rate of diversion, and no net increase in maximum annual quantity, from a specific point of diversion already authorized by another water right or approval of application shall be exempt from complying with any safe yield, allowable appropriation, or similar type of criteria adopted by the chief engineer if both of the following conditions are met:

(1) The application requests only an increase in the authorized maximum rate of diversion of 15 percent or less.

(2) There has been no significant physical enlargement of the capacity of the original diversion works to divert water. If a well has been replaced, reconstructed, and reequipped in accordance with an approval of an application for change by the chief engineer pursuant to K.S.A 82a-708b and amendments thereto in substantially the same way that the original diversion works were constructed, that type of well shall not be considered to be a significant physical enlargement of the diversion works. Conversion to a battery of wells or adding an additional well shall be considered to be a significant physical enlargement of the capacity of the diversion works.

(b) Except as set forth in subsection (c), an application to increase the rate of diversion by more than 15 percent that requests no net increase in maximum annual quantity from a specific point of diversion already authorized by another water right or approval of application shall be exempt

from complying with any safe yield, allowable appropriation, or similar type of criteria adopted by the chief engineer if the conditions in either paragraph (b)(1) or (2) are met:

(1)(A) The application was filed within the time authorized to perfect any water right authorizing that point of diversion.

(B) The application is filed to increase the authorized maximum rate of diversion to the rate the original diversion works were physically capable of diverting water under actual maximum operating conditions, or less.

(2) The appropriator demonstrates to the chief engineer that authorizing an increase in the rate of diversion meets the following criteria:

(A) Will not impair existing water rights;

(B) will not prejudicially and unreasonably affect the public interest; and

(C) will not substantially increase the consumptive use in violation of K.A.R. 5-5-3.

(c) If the chief engineer adopts a regulation pertaining to applications for additional rate only for a specific groundwater management district, or issues an order concerning that type of application pursuant to an intensive groundwater use control area (IGUCA) proceeding authorized by K.S.A. 82a-1036 et seq. and amendments thereto, the application for additional rate shall be processed by the chief engineer pursuant to the provisions of that regulation or IGUCA order. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-701(f), K.S.A. 1999 Supp. 82a-711, K.S.A. 82a-712, K.S.A. 82a-1036, K.S.A. 82a-1037, K.S.A. 1999 Supp. 82a-1038, K.S.A. 82a-1039, and K.S.A. 82a-1040; effective Sept. 22, 2000.)

5-4-8. Custodial care of the state. (a) For any groundwater or surface water right placed in the custodial care of the state, the following criteria shall be met by the chief engineer:

(1) Not reappropriate the water authorized to be diverted by a water right in the custodial care of the state;

(2) continue to include the priority, terms, limitations, authorized rate and quantity, and other conditions of the water right in any analysis or action conducted for the permitting, management, regulation, or administration of other water rights or applications to appropriate water;

(3) not declare the water right abandoned for the nonuse of water. Placement of the water right in the custodial care of the state shall be deemed to be due and sufficient cause for nonuse of a water right pursuant to K.S.A. 82a-718 and amendments thereto; and

(4) not dismiss the water right, unless the chief engineer determines that the geographic area in which the water right is located no longer meets the requirements of K.S.A. 2-1919(2), and amendments thereto, and reopens the area to new appropriations of water.

(b) A water right owner desiring to place a portion of an existing water right in the custodial care of the state shall request the division to divide the water right. Each portion of a divided water right shall be treated as a separate water right and administered accordingly. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-707(d) and K.S.A. 1999 Supp. 82a-718; effective Sept. 22, 2000.)

Article 5.—CHANGE IN THE PLACE OF USE, THE POINT OF DIVERSION OR THE USE MADE OF WATER UNDER AN EXISTING WATER RIGHT

5-5-1. Filing an application for change. (a) An application for approval to change the place of use, the point of diversion, the use made of water, or combinations thereof, filed pursuant to K.S.A. 82a-708b and amendments thereto, shall be made on a form prescribed by the chief engineer and shall include whatever information is required by the chief engineer to properly understand the proposed change in the place of use, the point of diversion, the use made of water, or any combination of these.

(b) Before the application may be accepted for filing, the application shall be signed by at least one owner of the water right, or a duly authorized agent of an owner.

(c) Except as set forth in subsection (e), before any approval of an application can be granted, all of the water right owners, including their spouses, or a duly authorized agent of the owners of the water right, shall verify upon oath or affirmation that the statements contained in the application are true and complete.

(d) If one or more owners refuse to sign the application, or a written request is filed by one or more owners to withdraw their signatures from the application before the application is approved, the application shall be dismissed.

(e) (1) An application to change the location of a groundwater point of diversion that proposes to do only the following shall be signed by at least

one owner of the approval of application or water right, or the duly authorized agent, who verifies upon oath or affirmation all of the items specified below in paragraph (e)(2):

(A) Move the location of the well 300 or fewer feet; and

(B) have the new well located on land owned by all the same owners as the owners of the original point of diversion.

(2) (A) The signer of the application for change has the authority to sign the application on behalf of all the owners.

(B) None of the ownership interests of any of the owners of the approval of application or water right will be adversely affected if the application for change is approved as filed.

(C) If the application is not approved expeditiously, there will be substantial damage to property, public health, or safety. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 1999 Supp. 82a-708b; modified, L. 1978, ch. 460, May 1, 1978; amended Sept. 22, 2000.)

5-5-2. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-708b; effective May 1, 1980; revoked May 1, 1983.)

5-5-2a. Complete change application. (a) An application to change a water right pursuant to K.S.A. 82a-708b, and amendments thereto, shall be considered to be a "complete application," if the application completely and accurately meets all of the requirements specified in this regulation and the following criteria:

(1) The requirements specified in K.S.A. 82a-708b, and amendments thereto;

(2) any water conservation plans required by the chief engineer pursuant to K.S.A. 82a-733, and amendments thereto;

(3) the requirements specified in K.A.R. 5-5-1;

(4) the requirements specified in K.A.R. 5-5-5;

(5) the requirements specified in K.A.R. 5-3-4d;

(6) a demonstration that the proposed point of diversion meets all applicable well spacing criteria; and

(7) the requirements of K.S.A. 82a-301 through K.S.A. 82a-305a, and amendments thereto, if the proposed point of diversion, or rediversion, is a dam or stream obstruction.

(b) If the applicant is requesting a waiver or exemption of a regulation pursuant to K.S.A. 82a-1904, and amendments thereto, the applicant shall submit a written request for the waiver or exemption, and documentation to support the waiver or exemption.

(c) If the proposed point of diversion is located within the boundaries of a groundwater management district, a final recommendation or an analysis of water availability has been received from the groundwater management district within the time allowed by the chief engineer concerning the approval, denial, or modification of the application.

(d) If any questions have been raised concerning whether approval of the application could cause impairment of senior water rights or prejudicially and unreasonably affect the public interest, the applicant shall submit sufficient information to resolve those questions.

(e) If any actions are required to be taken by the applicant on other approvals of applications or water rights owned by the applicant in order to make the application for change approvable, including dismissals, division agreements, reductions in water rights in accordance with K.A.R. 5-7-5, and applications for change, all necessary forms shall be completed and filed with the chief engineer.

(f) If the application involves a change in the place of use or the use made of water, the applicant shall submit all information and data necessary to ensure that the consumptive use will not be increased substantially in violation of K.A.R. 5-5-3.

(g) If the application proposes to add one or more additional wells in accordance with the provisions of K.A.R. 5-5-16, the applicant shall submit all tests, data, and information required by that regulation.

(h) If there is an issue as to whether the water right for which the change application has been filed has been abandoned in whole or in part pursuant to K.S.A. 82a-718, and amendments thereto, the applicant shall submit whatever information is necessary to resolve all abandonment issues.

(i) Each application shall be accompanied by an aerial photograph or a detailed plat with a scale of one inch equals 1,320 feet, or a U.S. geological survey topographic map with a scale of 1:24,000. The following information shall be plotted on the plat, photograph, or topographic map:

(1) The section corners;

(2) the center of the section, identified by the section number, township, and range;

(3) the actual location of the currently author-

ized point of diversion and the location of the proposed point of diversion indicated by appropriate symbols;

(4) the location of the place of use identified by crosshatching or by some other appropriate method;

(5) the location of all other water wells of every kind within one-half mile of the well or wells to be authorized by the proposed appropriation, each of which shall be identified by its use and the name and mailing address of the owner, if the proposed appropriation is for use of groundwater;

(6) the name and mailing address of the owner or owners of each tract of land adjacent to the stream for a distance of one-half mile upstream and one-half mile downstream from the property lines of the land owned or controlled by the applicant, if the proposed appropriation is for the use of surface water;

(7) the locations of proposed or existing dams, dikes, reservoirs, canals, pipelines, power-houses, and other structures for the purpose of storing, conveying, or using water; and

(8) a north arrow and scale.

All information shown on the photograph, plat, or map shall be legible. Black line prints may be submitted in lieu of the original drawing if a plat is submitted.

(j) The applicant shall certify on the application that all water wells of any kind located within one-half mile of the requested point of diversion have been plotted on the plat, photograph, or map attached to the application.

(k) The applicant shall submit all information and data necessary to demonstrate that the application complies with the applicable regulations adopted by the chief engineer. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706a, K.S.A. 2002 Supp. 82a-708b, K.S.A. 82a-709, K.S.A. 82a-710, K.S.A. 2002 Supp. 82a-711, K.S.A. 2002 Supp. 82a-718, K.S.A. 82a-733, and K.S.A. 2002 Supp. 82a-1904; effective Oct. 24, 2003.)

5-5-3. Change in consumptive use. The extent of consumptive use shall not be increased substantially after a vested right has been determined or the time allowed in which to perfect the water right has expired, including any authorized extension of time to perfect the water right. (Authorized by K.S.A. 82a-706a, 82a-708b; effective May 1, 1983.)

5-5-4. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-708b; effective May 1, 1980; revoked May 1, 1981.)

5-5-5. Signatures required on change applications. If more than one person is the owner of a water right, and an application is filed for a change in the place of use, point of diversion, use made of the water, or any combination thereof, only the signature(s) of the landowner(s) whose portion of the water right(s) is (are) involved in the change shall be required on the application. If the extent of each owners interest in the water right has not been legally determined, then all landowners holding an undetermined portion of the water right must sign the change application or the landowners must submit an agreement signed by all landowners agreeing how the water right should be divided. (Authorized by K.S.A. 82a-706a, 82a-708b; effective May 1, 1980.)

5-5-6. Failure to construct diversion works at authorized location. (a) If an application to appropriate water for beneficial use is approved by the chief engineer, the location of the point of diversion shall be limited to a specific tract of land and to within 300 feet of a point identified in distances measured in feet north and west from the southeast corner of the legal section.

(b) If the diversion works were not constructed at the location authorized for the point of diversion, but the appropriator can demonstrate to the satisfaction of the chief engineer that all of the following criteria have been met, the authorized location shall be corrected to the actual location of the point of diversion by a correctional order issued by the chief engineer:

(1) The original application was filed before January 1, 1978.

(2) The diversion works were constructed before the date the original application to appropriate water was signed.

(3) It was not discovered that the actual diversion works were not constructed at the authorized point of diversion until after the application was approved.

(4) The diversion works were constructed at a location that could have been approved at the time the original application was filed based on the criteria in effect at the time the original application was filed.

(c) An application for a change in point of diversion filed pursuant to K.S.A. 82a-708b and amendments thereto shall be approved by the

chief engineer, authorizing the actual location where the diversion works were constructed and extending the time to construct the diversion works until the end of the calendar year in which the application to change the point of diversion was approved, if the diversion works were not constructed at the authorized location, but the appropriator can demonstrate to the satisfaction of the chief engineer that all of the following criteria have been met:

(1) The original application was filed with the chief engineer before January 1, 1978.

(2) The diversion works were completed after the application was filed, but within the time authorized to construct the diversion works.

(3) The diversion works were constructed within 1,320 feet of the authorized point of diversion.

(4) The diversion works were constructed at a location that could have been approved at the time that the original application was filed based upon the criteria in effect at the time the original application was filed.

(5) The change application meets the other criteria of K.S.A. 82a-708b and amendments thereto.

If the actual point of diversion is within a groundwater management district, the application shall be sent to the groundwater management district board for review and recommendation.

(d) The point of diversion shall be authorized at the actual location by approval of a new application to appropriate water by the chief engineer if the diversion works were not constructed at the authorized location, but the appropriator can demonstrate to the chief engineer that all of the following criteria have been met:

(1) The original application was filed on or after January 1, 1978.

(2) The diversion works were subsequently completed within the time authorized to complete the diversion works.

(3) The diversion works were constructed within 1,320 feet of the authorized point of diversion.

(4) The time authorized to complete the diversion works has expired.

(5) There is no water available for a new appropriation to be approved at the location of the actual point of diversion.

(6) The application would have met all the criteria for a new application that were in effect at the time the original new application was filed.

If the actual point of diversion is within a groundwater management district, the application shall be sent to the groundwater management district board for review and recommendation. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 1999 Supp. 82a-708b, and K.S.A. 82a-728; effective May 1, 1980; amended Sept. 22, 2000.)

5-5-7. Waste of water. Each person shall not commit a waste of water as defined in these regulations. Upon a finding by the chief engineer that waste of water has occurred, the chief engineer may suspend use of that water right until the owner shows to the satisfaction of the chief engineer that the waste of water will no longer occur. (Authorized by K.S.A. 82a-706(a); implementing K.S.A. 82a-706; effective Dec. 3, 1990.)

5-5-8. Standards for approval of an application for a change in the place of use and a change in the use made of water. (a) Each application for a change in the place of use or the use made of water which will materially injure or adversely affect water rights or permits to appropriate water with priorities senior to the date the application for change is filed shall not be approved by the chief engineer.

(b) Each approval of a change application shall be conditioned by the chief engineer with the terms, conditions and limitations the chief engineer deems necessary to protect the public interest and enforce the terms of K.A.R. 5-5-3.

(c) As used in K.A.R. 5-5-3, "consumptive use" means gross diversions minus:

(1) waste of water, as defined in K.A.R. 5-1-1(cc); and

(2) return flows to the source of water supply:

(A) through surface water runoff which is not waste; and

(B) by deep percolation.

(d) The maximum annual quantity and maximum rate of diversion of water authorized by an approval of an application for a change in the use made of water shall not exceed the maximum annual quantity or maximum rate of diversion perfected at the time the application for change in the use made of water is filed with the chief engineer. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 1993 Supp. 82a-708b; effective Nov. 28 1994).

5-5-9. Criteria for the approval of an application for a change in the use made of water from irrigation to any other type of beneficial use of water. (a) The approval of a change

in the use made of water from irrigation to any other type of beneficial use shall not be approved if it will cause the net consumptive use from the local source of water supply to be greater than the net consumptive use from the same local source of water supply by the original irrigation use based on the following criteria:

(1) The maximum annual quantity of water to be allowed by the change approval shall be the net irrigation requirement (NIR) for the 50% chance rainfall for the county of origin, as set forth in K.A.R. 5-5-12, multiplied by the maximum acreage legally irrigated under the authority of the water right in any one calendar year during the perfection period. For vested rights, the acreage used shall be the maximum acreage irrigated prior to June 28, 1945; or

(2) if the applicant establishes to the satisfaction of the chief engineer the need for more flexibility in the authorized annual quantity, the application may be approved subject to the following limits.

(A) The maximum annual quantity of water to be allowed by the change approval shall be the NIR for the 80% chance rainfall for the county of origin, as set forth in K.A.R. 5-5-12, multiplied by the maximum acreage legally irrigated in any one calendar year during the perfection period. For vested rights the acreage used shall be the maximum acreage irrigated prior to June 28, 1945.

(B) The new type of beneficial use shall be further limited by a five year fixed allocation of water in which the NIR for a 50% chance rainfall for the county of origin, as set forth in K.A.R. 5-5-12, is multiplied by five times the maximum acreage lawfully irrigated in any one calendar year during the perfection period. For vested rights, the acreage used shall be the maximum acreage irrigated prior to June 28, 1945.

(C) An application for a term permit which will circumvent the five year allocation of water limit shall not be approved by the chief engineer.

(3) In determining whether the net consumptive use of water will be increased by the proposed change in the use made of water, the applicant shall be given credit by the chief engineer for any return flows from the proposed type of beneficial use which will return to the same local source of supply as the return flows from the originally authorized type of beneficial use as substantiated by the applicant to the satisfaction of the chief engineer by an engineering report or similar type of hydrologic analysis.

(4) The authorized quantity to be changed to the new type of beneficial use shall never exceed the maximum annual quantity authorized by the water right.

(5) If a water right which overlaps the authorized place of use of one or more other water rights, either in whole or in part, is being changed to a different type of beneficial use, the total net consumptive use of all water rights after the change is approved shall not exceed the total net consumptive use of all of the rights before the change is approved.

(6) The approval for a change in the use made of water shall also be limited by that quantity reasonable for the use proposed by the change in the use made of water.

(b) Upon request of the applicant, the historic net consumptive use actually made during the perfection period, or prior to June 28, 1945 in the case of vested rights, under the water right proposed to be changed shall be considered by the chief engineer, but the burden shall be on the owner to document that historic net consumptive use with an engineering study, or an equivalent documentation and analysis, and demonstrate to the satisfaction of the chief engineer that the analysis submitted by the applicant is a more accurate estimate of the historic net consumptive use than the net consumptive use calculated using the methodology set forth in paragraph (a)(1).

(c) If the methods set forth in subsection (a) produce an authorized annual quantity of water which appears to be unrealistic and could result in impairment of other water rights, the chief engineer shall make a site-specific net consumptive use analysis to determine the quantity of water which was actually beneficially consumed under the water right. The quantity approved shall be limited to the quantity determined to be reasonable by the chief engineer's analysis. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 1993 Supp. 82a-708b; effective Nov. 28, 1994.)

5-5-10. Partial changes in the use made of water from irrigation to another type of beneficial use. (a) In a case where an irrigation right is to be divided and only a portion of the rate and quantity will be changed to a different use made of water, only that portion of the annual quantity of the water right being changed to a different type of beneficial use shall be reduced as necessary to prevent the net consumptive use from increasing substantially.

(b) The authorized place of use for the irrigation right shall generally be reduced in proportion to the reduction in annual quantity caused by the change. If the irrigator desires to retain more than his or her proportional allotment of acres after the change, the procedures outlined in K.A.R. 5-5-11(b)(2)(B)(ii) shall be followed to determine whether the irrigator shall be allowed to retain more acreage.

(c) The authorized rate of diversion shall be divided between the irrigation and the non-irrigation use. Any reasonable division of the rate by the parties shall be approved. The division of the maximum rate of diversion need not be proportional to the division of the quantity as long as the division of the rate of diversion is reasonable to divert each portion of the annual quantity of water after the division of the water right is made.

(d) The division of the annual quantity shall be made as follows:

(1) Step one.

(A) Multiply the net irrigation requirement (NIR) for the 50% chance rainfall for the county of origin, as set forth in K.A.R. 5-5-12, times the maximum number or acres irrigated in any one calendar year during the perfection period. For vested rights, the acreage used shall be the maximum acreage irrigated prior to June 28, 1945.

(B) This will result in the maximum quantity that could be changed to another type of beneficial use if the entire right were changed pursuant to K.A.R. 5-5-9(a)(1).

(2) Step two.

(A) Divide the annual quantity desired to be changed to the new use by the maximum quantity that could be changed if the entire right were changed.

(B) This will result in the percentage of the entire reduced right that will be changed to the new use. The remaining percentage of the current right can be retained by the irrigation water right owner.

(3) Step three.

(A) Multiply the remaining percentage times the total currently authorized quantity. This shall be the annual quantity of water which may be retained by the irrigation water right owner. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 1993 Supp. 82a-708b; effective Nov. 28, 1994.)

5-5-11. Applications for change in place of use for irrigation purposes. (a) For the purpose of this regulation, "base acreage" means:

(1) the maximum number of acres actually legally irrigated in any one calendar year on or before December 31, 1994 if the perfection period expired on or before December 31, 1994 or the water right is a vested right; or

(2) if the perfection period expires after December 31, 1994, and the perfection period has not expired at the time the change application has been filed, the base acreage shall be the number of acres authorized by the permit; or

(3) if the perfection period expires after December 31, 1994, and the perfection period has expired at the time the change application was filed, the base acreage shall be the maximum acreage legally irrigated in any one calendar year during the perfection period.

(4) Any year in which any of the terms, conditions and limitations of the water right or permit were violated shall not be used to determine base acreage.

(b) An application to change the authorized place of use for irrigation purposes which would permit the applicant to exceed the base acreage by 10 acres or 10 percent, whichever is less, shall not be approved by the chief engineer because it would result in a substantial increase in net consumptive use in violation of K.A.R. 5-5-3 except when one of the six following criteria are met.

(1) Identical places of use.

(A) The change application shall be filed only for the purpose of creating an identical place of use with another water right or rights;

(B) there shall not be a net increase in authorized acres;

(C) each water right involved in the proposed identical overlap in place of use shall be certified by the chief engineer prior to processing the change application if approval of the change application would authorize an increase in base acreage; and

(D) the total quantity authorized by all existing water rights and all permits involved shall be reasonable to irrigate the land authorized after the change in place of use is approved.

(2) Necessity to install more efficient irrigation system; limited acres and quantity.

(A) The change applicant shall submit information demonstrating to the satisfaction of the chief engineer that it is necessary to increase the base acreage so that a significantly more efficient irrigation delivery system may be installed. Types of crops to be grown or tillage practices used shall

not be considered in deciding whether the proposed system is more efficient.

(B) If the chief engineer approves the application for a change in place of use pursuant to this subsection, the following limitations shall apply.

(i) The authorized quantity of water under the water right shall be limited to a 5 year fixed allocation, computed by dividing the net irrigation requirement (NIR), as set forth in K.A.R. 5-5-12, for the 50% chance rainfall for the county where the place of use is located, by an efficiency factor of 0.85, multiplying by the base acreage as determined in subsection (a) of this regulation, and then multiplying by 5. In any given year, the water right owner shall still be authorized to divert the maximum annual quantity authorized, provided that the 5 year allocation is not exceeded.

(ii) The maximum number of irrigated acres that shall be allowed under the proposed change in place of use shall be computed by multiplying the currently authorized annual quantity by 0.85 and dividing by the NIR, as set forth in K.A.R. 5-5-12, for the 80% chance rainfall for the county where the place of use is located.

(iii) The approval of the change shall be conditioned so that the use of water in excess of the five year allocation shall result in a two year suspension of all water use under that water right and a subsequent restriction of the authorized place of use to the base acreage at a location specifically set forth in the change approval.

(3) Necessity to install a more efficient irrigation system; limited quantity.

(A) The groundwater management district in which the point of diversion is located shall agree to assume monitoring responsibility to ensure compliance with the conditions of the change approval;

(B) the applicant shall submit information demonstrating to the satisfaction of the chief engineer that it is necessary to increase the base acreage so that a significantly more efficient irrigation delivery system may be installed;

(C) the applicant shall submit a feasible operation plan demonstrating to the satisfaction of the chief engineer that the amount of water available for appropriation under that water right is reasonable to irrigate the number of acres requested to be irrigated; and

(D) the water right owner shall have no recent pattern of water use significantly in excess of the maximum annual quantity of water authorized.

(E) If the chief engineer approves the application for a change in place of use pursuant to this subsection, the following limitations shall apply.

(i) The authorized quantity of water under the water right shall be limited to a 5-year fixed allocation, computed by dividing the net irrigation requirement (NIR), as set forth in K.A.R. 5-5-12, for the 50% chance rainfall for the county where the place of use is located by an efficiency factor of 0.85, multiplying by the base acreage irrigated as determined in subsection (a) of this regulation, and then multiplying by 5. In any given year, the water right owner shall still be authorized to divert the maximum annual quantity authorized, provided that the 5-year allocation is not exceeded.

(ii) The approval of the change shall be conditioned so that the use of water in excess of the five-year allocation shall result in a two-year suspension of all water use under that water right and a subsequent restriction of the authorized place of use to the base acreage at a location specifically set forth in the change approval.

(4) Rotation of the irrigated land within the authorized place of use.

(A) The point of diversion is located outside a groundwater management district or the groundwater management district in which the point of diversion is located shall agree to assume monitoring responsibility to ensure compliance with the conditions of the change approval;

(B) the water right owner shall have no recent pattern of water use significantly in excess of the maximum annual quantity of water authorized; and

(C) approval of the change application shall result in a net increase in the number of acres authorized for irrigation purposes solely for the purpose of rotation of the irrigated land within the authorized place of use.

(D) If the chief engineer approves the application for a change in place of use pursuant to this subsection, the following limitations shall apply.

(i) Approval of the change application shall be limited by the chief engineer so that the net acres physically irrigated in any one calendar year after the change approval shall not exceed the base acreage; and

(ii) the approval shall be conditioned so that the use of water on more than the maximum number of acres authorized to be irrigated in any one calendar year shall result in a two-year suspension of all water use under that water right and a subsequent restriction of the authorized place of use

to the base acreage at a location specifically set forth in the change approval.

(5) Specific groundwater management district regulation.

The application shall meet the criteria in a regulation adopted by the chief engineer pursuant to K.S.A. 82a-1028(o) and K.S.A. 82a-706a specifically for changes in place of use for irrigation purposes for the groundwater management district in which the point of diversion is located.

(6) No increase in historic net consumptive use.

The applicant shall demonstrate to the satisfaction of the chief engineer, with an engineering report or similar type of hydrologic analysis, that the historic net consumptive use will not be increased substantially if the proposed change in place of use is approved.

(c) If the chief engineer determines that the application cannot be approved as filed, the applicant shall be notified in writing by the chief engineer prior to denial that the change application requirements have not been met and the reason for the proposed denial.

(1) In this written notice the chief engineer shall allow the applicant 15 days to request time in which to submit additional information to show why the application should be approved.

(2) Upon written request, the applicant shall be given a reasonable time specified by the chief engineer to submit an engineering report or similar type of hydrologic analysis to show that approval of the change application will not substantially increase the historic net consumptive use.

(3) The applicant shall have the burden of demonstrating to the satisfaction of the chief engineer that approval of the change application will not cause the historic net consumptive use to be increased substantially.

(d) Whether or not the time to perfect the water right has expired, including any authorized extensions of time, the application for a change in place of use to change the size of the authorized place of use for irrigation purposes may be approved without the certificate of appropriation being issued except as provided in subsection (b)(1)(C) of this regulation.

(1) If a certificate of appropriation has not been issued, the increase in base acreage shall be determined based on reliable information.

(2) The types of acceptable information shall include, but not be limited to, field inspection reports or U.S. department of agriculture records.

(e) A flow meter meeting the specifications adopted by the chief engineer, and installed and maintained in a manner satisfactory to the chief engineer, shall be required by the chief engineer in all cases where there is an increase in the base acreage authorized to be irrigated by the approval of the change in the place of use, except when:

(1) the application for change in place of use is filed solely to create an identical place of use with other water rights; and

(2) the total quantity authorized by all existing water rights and all permits to appropriate water that are involved equals or exceeds the NIR, as set forth in K.A.R. 5-5-12, in that county for a 50% chance rainfall divided by an irrigation efficiency of 0.85. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 1993 Supp. 82a-708b; effective Nov. 28, 1994.)

5-5-12. Net irrigation requirements (NIR). The following amounts shall be used as the net irrigation requirements (NIR).

County	50% Chance Rainfall	80% Chance Rainfall
Allen	7.1" = 0.59'	9.9" = 0.83'
Anderson	6.1" = 0.51'	9.4" = 0.78'
Atchison	7.2" = 0.60'	10.3" = 0.86'
Barber	12.6" = 1.05'	14.6" = 1.22'
Barton	12.0" = 1.00'	14.4" = 1.20'
Bourbon	6.8" = 0.57'	9.6" = 0.80'
Brown	7.1" = 0.59'	10.6" = 0.88'
Butler	9.2" = 0.77'	12.0" = 1.00'
Chase	8.7" = 0.73'	11.4" = 0.95'
Chautauqua	8.6" = 0.72'	11.4" = 0.95'
Cherokee	7.0" = 0.58'	9.9" = 0.83'
Cheyenne	13.7" = 1.14'	15.4" = 1.28'
Clark	13.7" = 1.14'	15.7" = 1.31'
Clay	9.2" = 0.77'	12.2" = 1.02'
Cloud	10.3" = 0.86'	12.7" = 1.06'
Coffey	6.8" = 0.57'	9.9" = 0.83'
Comanche	13.0" = 1.08'	15.1" = 1.26'
Cowley	9.7" = 0.81'	12.3" = 1.03'
Crawford	7.0" = 0.58'	9.8" = 0.82'
Decatur	12.7" = 1.06'	14.8" = 1.23'
Dickinson	9.4" = 0.78'	12.3" = 1.03'
Doniphan	7.3" = 0.61'	10.3" = 0.86'
Douglas	6.8" = 0.57'	9.8" = 0.82'
Edwards	13.0" = 1.08'	15.1" = 1.26'
Elk	8.7" = 0.73'	11.3" = 0.94'
Ellis	12.2" = 1.02'	14.6" = 1.22'
Ellsworth	11.5" = 0.96'	13.7" = 1.14'
Finney	14.5" = 1.21'	16.3" = 1.36'
Ford	13.7" = 1.14'	15.7" = 1.31'
Franklin	5.8" = 0.48'	9.1" = 0.76'
Geary	8.4" = 0.70'	11.5" = 0.96'
Gove	13.1" = 1.09'	15.3" = 1.28'
Graham	12.4" = 1.03'	14.7" = 1.23'

County	50% Chance Rainfall	80% Chance Rainfall
Grant	14.9" = 1.24'	16.7" = 1.39'
Gray	13.8" = 1.15'	16.1" = 1.34'
Greeley	14.7" = 1.23'	16.5" = 1.38'
Greenwood	8.1" = 0.68'	11.1" = 0.93'
Hamilton	15.2" = 1.27'	16.9" = 1.41'
Harper	11.7" = 0.98'	14.0" = 1.17'
Harvey	10.2" = 0.85'	12.9" = 1.08'
Haskell	14.5" = 1.21'	16.4" = 1.37'
Hodgeman	13.4" = 1.12'	15.5" = 1.29'
Jackson	7.4" = 0.62	10.5" = 0.88'
Jefferson	7.0" = 0.58'	10.1" = 0.84'
Jewell	10.6" = 0.88'	13.1" = 1.09'
Johnson	6.6" = 0.55'	9.5" = 0.79'
Kearny	14.9" = 1.24'	16.6" = 1.38'
Kingman	11.7" = 0.98'	14.0" = 1.17'
Kiowa	13.2" = 1.10'	15.1" = 1.26'
Labette	7.3" = 0.61'	10.3" = 0.86'
Lane	13.7" = 1.14'	15.7" = 1.31'
Leavenworth	7.0" = 0.58'	9.9" = 0.83'
Lincoln	11.3" = 0.94'	13.6" = 1.13'
Linn	5.6" = 0.47'	9.0" = 0.75'
Logan	13.9" = 1.16'	15.8" = 1.32'
Lyon	7.5" = 0.63'	10.5" = 0.88'
Marion	9.6" = 0.80'	12.2" = 1.02'
Marshall	8.7" = 0.73'	11.4" = 0.95'
McPherson	10.8" = 0.90'	13.1" = 1.09'
Meade	14.3" = 1.19'	16.1" = 1.34'
Miami	5.0" = 0.42'	9.0" = 0.75'
Mitchell	10.8" = 0.90'	13.3" = 1.11'
Montgomery	8.1" = 0.68'	10.9" = 0.91'
Morris	8.5" = 0.71'	11.4" = 0.95'
Morton	15.4" = 1.28'	17.1" = 1.43'
Nemaha	7.8" = 0.65'	10.9" = 0.91'
Neosho	7.1" = 0.59'	10.2" = 0.85'
Ness	13.3" = 1.11'	15.3" = 1.28'
Norton	12.3" = 1.03'	14.4" = 1.20'
Osage	7.0" = 0.58'	9.9" = 0.83'
Osborne	11.7" = 0.98'	13.8" = 1.15'
Ottawa	10.5" = 0.88'	12.9" = 1.08'
Pawnee	12.7" = 1.06'	14.9" = 1.24'
Phillips	11.7" = 0.98'	14.0" = 1.17'
Pottawatomie	8.1" = 0.68'	11.1" = 0.93'
Pratt	12.6" = 1.05'	14.6" = 1.22'
Rawlins	13.2" = 1.10'	15.1" = 1.26'
Reno	11.4" = 0.95'	13.8" = 1.15'
Republic	10.0" = 0.83'	12.6" = 1.05'
Rice	11.5" = 0.96'	13.8" = 1.15'
Riley	8.5" = 0.71'	11.4" = 0.95'
Rooks	12.0" = 1.00'	14.3" = 1.19'
Rush	12.6" = 1.05'	14.8" = 1.23'
Russell	11.3" = 0.94'	14.1" = 1.18'
Saline	10.8" = 0.90'	13.1" = 1.09'
Scott	14.0" = 1.17'	15.9" = 1.33'
Sedgwick	10.7" = 0.89'	13.1" = 1.09'
Seward	14.5" = 1.21'	16.4" = 1.37'
Shawnee	7.4" = 0.62'	10.2" = 0.85'
Sheridan	12.9" = 1.08'	15.0" = 1.25'
Sherman	14.1" = 1.18'	15.7" = 1.31'
Smith	11.4" = 0.95'	13.6" = 1.13'
Stafford	12.3" = 1.03'	14.5" = 1.21'
Stanton	15.6" = 1.30'	17.2" = 1.43'
Stevens	14.8" = 1.23'	16.8" = 1.40'
Sumner	10.3" = 0.86'	13.2" = 1.10'
Thomas	13.5" = 1.13'	15.4" = 1.28'
Trego	12.9" = 1.08'	15.0" = 1.25'
Wabaunsee	7.8" = 0.65'	10.7" = 0.89'
Wallace	14.3" = 1.19'	16.1" = 1.34'
Washington	9.2" = 0.77'	12.0" = 1.00'
Wichita	14.4" = 1.20'	16.3" = 1.36'
Wilson	8.0" = 0.67'	10.7" = 0.89'
Woodson	7.4" = 0.62'	10.4" = 0.87'
Wyandotte	7.0" = 0.58'	9.8" = 0.82'

(Authorized by K.S.A. 82a-706a; implementing K.S.A. 1993 Supp. 82a-708b; effective Nov. 28, 1994.)

5-5-13. Relocation of alluvial wells. If an authorized point of diversion is a well that has as its source of supply an alluvium in a reach of a basin that is fully appropriated or closed to new appropriations, the approval of a change in point of diversion, and any subsequent approvals of changes in points of diversion, shall not authorize the distance between the well and the centerline of the stream to be decreased by more than 10 percent since the time the source of supply became fully appropriated or was closed to new appropriations. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 1999 Supp. 82a-708b; effective Sept. 22, 2000.)

5-5-14. Duties of owners of approvals of applications and water rights. (a) All of the owners of an approval of application or a water right shall be responsible for taking all legally required actions necessary to maintain the validity of the approval of application or water right, including the filing of statutorily required fees, reports, and applications.

(b) (1) Unless the approval of application or the water right has been severed from the authorized place of use, except as set forth in paragraph (b) (2), all of the owners of the authorized place of use shall be considered to be the owners of the approval of application or the water right.

(2) Unless the chief engineer has documentation to the contrary, an approval of application or water right for municipal use shall be considered to be owned by the entity owning and operating the water distribution system. A water right for an

irrigation district shall be considered to be owned by the irrigation district. (Authorized by and implementing K.S.A. 82a-706a; effective Sept. 22, 2000.)

5-5-16. Additional wells. (a) An application for approval to change the point of diversion to add an additional point of diversion to divert groundwater, by either constructing a new well or moving a portion of a water right to a well that has previously been authorized by the chief engineer, shall not be approved unless it meets the following requirements:

(1) The provisions of K.S.A. 82a-708b, and amendments thereto, and any applicable regulations adopted by the chief engineer shall be met.

(2) The total maximum quantity of water authorized to be diverted each calendar year by the original well or wells, and the additional well or wells, shall not exceed any of the following limits:

(A) The maximum annual quantity of water that has been perfected;

(B) the maximum annual quantity of water authorized to be diverted before approval of the change; or

(C) the maximum consumptive use during the perfection period as required by K.A.R. 5-5-3 and as specified in either paragraph (a) (2) (C) (i) or (ii):

(i) If the water right authorizes the use of water for irrigation use, the consumptive use shall be presumed to not be increased in violation of K.A.R. 5-5-3 if the maximum annual quantity requested does not exceed the quantity in acre-feet calculated by use of the following formula: multiply the maximum number of acres legally irrigated in any one year during the perfection period by the 80 percent chance net irrigation requirements (N.I.R.), as set forth in K.A.R. 5-5-12 expressed in acre-feet, and divide that number by a delivery efficiency of 0.85.

(ii) If the beneficial use authorized is not irrigation, the net consumptive use during the perfection period shall be determined using the best information available.

(3) The total maximum rate of diversion that may be authorized for the original well or wells and the additional well or wells shall not be greater than the total maximum rate of diversion that could have been diverted from the original well or wells if they were currently being replaced by new wells at substantially the originally authorized location or locations in the same local source of supply. A reasonable value for the maximum rate of diversion shall be one of the following:

(A) The total rate of diversion based on a current water flow rate test done on the point or points of diversion; or

(B) a value based on a valid hydraulic analysis submitted by the applicant showing the current capacity of the aquifer to yield water at the currently authorized point or points of diversion.

(4) A condition shall be placed on the approval of the application for change authorizing the additional well or wells that provides that, for the sole purpose of administering wells concerning direct impairment, the additional well or wells shall be considered to have the priority of the date the application was filed to add the additional well or wells.

(b) The applicant shall submit the following information:

(1) A well completion log of the currently authorized well or a stratigraphic log of a test hole located within 300 feet of the currently authorized well;

(2) the depth of the currently authorized well;

(3) the current depth to the static water level of the currently authorized well;

(4) a stratigraphic log of a test hole located within 300 feet of the proposed location of each of the proposed additional well or wells; and

(5) any additional information that the chief engineer needs to understand the nature of the proposed additional well or wells.

(c) The proposed additional well or wells shall meet one of the following conditions:

(1) Meet the well spacing requirements to all other wells with a priority earlier than the date the change application was filed; or

(2) if a hydraulic analysis shows that the approval of the proposed additional well within 300 feet of the currently authorized well location will neither impair any water rights senior to the date the application for change was filed nor prejudicially and unreasonably affect the public interest, be located within a 300-foot radius of one of the wells, or the geocenter if the currently authorized point of diversion is a battery of wells, authorized pursuant to the water right upon which the change application has been filed.

(d) Each point of diversion authorized by an approval of an application for change for an additional well shall have a specific assignment of a

maximum instantaneous rate of diversion and a maximum annual quantity of water.

(e) Each well authorized by a water right that has been changed under the provisions of this regulation shall be equipped with a separate water flowmeter that meets or exceeds the specifications for water flowmeters adopted by the chief engineer.

(f) Each approval of an additional well or wells shall have a condition that reserves jurisdiction for the chief engineer to review the approval of the additional well or wells at intervals of no fewer than five years, and not more than 10 years, to determine if the total annual quantity of water actually being withdrawn by all wells authorized by the approval of an application for change is exceeding the total annual quantity of water that could have been physically withdrawn if the additional well or wells had not been approved. If the chief engineer determines during the review that the total annual quantity being withdrawn by all the wells, including the additional wells, exceeds the total annual quantity of water that could have been physically withdrawn by the original well or wells, the total maximum annual quantity that can be withdrawn by all the wells shall be reduced by the chief engineer to the total maximum annual quantity that could have been physically withdrawn by the original well or wells. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-708b; effective Sept. 22, 2000; amended Oct. 24, 2003.)

Article 6.—STORAGE OF WATER

5-6-1. Application proposing storage, contents. Any person intending to store water may make application to the chief engineer in the same manner as any other person making application for permit to appropriate water for beneficial use. The application shall set forth the same general information as any other application for permit to appropriate water for beneficial use and, in addition, shall be accompanied by information to show:

(a) The area-capacity data of the reservoir in which the water is to be stored.

(b) The drainage area.

(c) The names and mailing addresses of the owners of lands that will be inundated by water accumulated in the reservoir.

(d) Any additional information as may be required by the chief engineer for a proper understanding of the proposed appropriation and storage of water. (Authorized by K.S.A. 82a-706a; modified, L. 1978, ch. 460, May 1, 1978.)

5-6-2. Storage of water in watershed district reservoirs. When a person makes application for permit to appropriate water for beneficial use proposing the storage of water in a watershed district reservoir, the application shall be accompanied by one of the following:

(a) A copy of an agreement or letter from the board of directors of the watershed district that states it was mutually agreed and understood at the time an easement was granted by the landowner that the landowner was to have the use of space in the sediment pool to store the water to which he or she might be entitled under the water appropriation act.

(b) A copy of a resolution by the board of directors that shows, as of a certain date, the board allocated or gave to the landowner all or a specified part of the sediment pool for the storage of water in accordance with the water appropriation act. (Authorized by K.S.A. 82a-706a; modified, L. 1978, ch. 460, May 1, 1978.)

5-6-3. Potential net evaporation. (a) The Kansas department of agriculture, division of water resources' map titled "potential net evaporation, in inches, for Kansas," dated September 6, 1996, is hereby adopted by reference for the purpose of determining potential net evaporation from a free water surface.

(b) The values on the map shall be used in all situations in which determination of potential net evaporation from a free water surface is necessary, including the following:

(1) Calculating the maximum annual quantity of water allowed to be appropriated for the storage of surface water in a reservoir;

(2) computing the annual amount of evaporation that will be caused by exposing the groundwater table;

(3) calculating the quantity of evaporation from surface water or exposed groundwater that will be used to determine annual water use; and

(4) determining the maximum annual quantity of water that is perfected pursuant to K.S.A. 82a-714 and amendments thereto.

(c) The values shown on the map shall be used unless the applicant provides, or the chief engineer has available, better or more site-specific data concerning potential net evaporation. (Authorized by K.S.A. 82a-706a; implementing K.S.A.

82a-707(e), K.S.A. 1999 Supp. 82a-711, and K.S.A. 1999 Supp. 82a-714; effective Sept. 22, 2000.)

5-6-4. Determination of potential annual runoff. (a) Unless the applicant for an approval of application supplies, or the chief engineer has available, better or more site-specific data, the potential annual runoff shall be determined using the following:

(1) A 20 percent chance of occurrence of runoff by extrapolating from the "annual yield of runoff" graph of the United States department of agriculture, natural resources conservation service, national engineering handbook series, part 650, engineering field handbook, EFM notice KS-38, dated December 12, 1991, which is adopted by reference;

(2) the soil cover complex number of the drainage basin, using the "generalized soil cover complex number" map of Kansas produced by the Kansas department of agriculture, division of water resources, dated August 1999, which is hereby adopted by reference;

(3) the normal annual precipitation in the watershed as set forth in K.A.R. 5-6-12; and

(4) the area of the watershed of the reservoir determined by using a United States geological survey 7½-minute topographic map.

(b) In computing the potential annual runoff of the watershed of the reservoir, if the quantity of water applied for, or authorized by, prior upstream surface water and groundwater applications, approvals of applications, and existing water rights within the watershed of the reservoir will significantly decrease the potential annual runoff available for appropriation in the reservoir, the impact of those rights on the potential annual runoff shall be subtracted from the total computed potential annual runoff in order to determine the potential annual runoff available. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-707(e) and K.S.A 1999 Supp. 82a-711; effective Sept. 22, 2000.)

5-6-5. Maximum reasonable annual quantity for storage of water for beneficial use in a reservoir. The maximum reasonable annual quantity of water that may be authorized for appropriation by the chief engineer for diversion and storage in a reservoir shall be limited to the maximum of either of the following:

(a) The potential annual runoff; or

(b) the total of the following:

(1) A three-year supply of water to be rediverted for all authorized beneficial uses; and

(2) a three-year supply of water for indirect use subject to the following limitations:

(A) A maximum of three years of indirect use shall be authorized for each reservoir as a whole; and

(B) If the maximum annual quantity of water requested for rediversion exceeds the reservoir capacity, the maximum annual quantity of water authorized to be diverted and stored in any one year shall not exceed the total of the following:

(i) The annual quantity of water rediverted for beneficial use;

(ii) the reservoir capacity; and

(iii) one year of indirect use from the reservoir. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-707(e), K.S.A. 1999 Supp. 82a-711, and K.S.A. 82a-712; effective Sept. 22, 2000.)

5-6-6. Initial filling and refilling of a reservoir. (a) The initial filling of a reservoir that has a capacity that exceeds the maximum annual quantity of water authorized shall be authorized by a special condition on the approval of application.

(b) Each refilling of a reservoir after the release of water for maintenance or similar reasons shall be required to be authorized by a term permit if the reservoir capacity exceeds the maximum annual quantity authorized. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-707(e), K.S.A. 1999 Supp. 82a-711, and K.S.A. 82a-712; effective Sept. 22, 2000.)

5-6-7. Determination of average annual potential net evaporation loss. The average annual potential net evaporation loss shall be determined by multiplying the surface area of the reservoir at the top of the reservoir capacity times the value for average annual potential net evaporation, as set forth in K.A.R. 5-6-3, for the township in which the point of diversion is located. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-707(e), K.S.A. 1999 Supp. 82a-711, and K.S.A. 82a-712; effective Sept. 22, 2000.)

5-6-8. Determination of average annual seepage loss from a reservoir. Average annual seepage loss from a reservoir shall be determined by the chief engineer based on relevant, credible information furnished by the applicant. If no relevant, credible information is supplied by the applicant, it shall be assumed by the chief engineer

that there is no seepage loss. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-707(e), K.S.A. 1999 Supp. 82a-711, and K.S.A. 82a-712; effective Sept. 22, 2000.)

5-6-9. Administration of surface water stored in a reservoir. Water lawfully stored within any reservoir authorized to store water for subsequent beneficial use shall not be subject to administration unless senior water right holders downstream of the reservoir make an appropriate request to have water bypassed to satisfy their senior water right within two weeks of the runoff event, or any other time frame in which inflow to the reservoir could reasonably have been expected to be available to the downstream senior water right if the reservoir had not impounded the water. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706b; effective Sept. 22, 2000.)

5-6-10. Authorized place of use for stored surface water. The approval of application shall limit the authorized place of use to the actual location where the water will be put to beneficial use. If the authorized use is for recreational use within the reservoir only, the authorized place of use shall not exceed the size and location of the surface area of the reservoir at the elevation of the top of the principal spillway. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 1999 Supp. 82a-711 and K.S.A. 82a-712; effective Sept. 22, 2000.)

5-6-11. Reasonable rate of diversion for storage of surface water in a reservoir. Each approval of application shall limit the rate of diversion for storage of surface water in a reservoir to all natural flows not necessary to satisfy all of the following:

(a) Senior water rights;

(b) senior approvals of applications;

(c) senior water reservation rights; and

(d) senior minimum desirable stream flows pertaining to the use of water from the same source of water supply. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-712; effective Sept. 22, 2000.)

5-6-12. Average annual precipitation. (a) The Kansas department of agriculture, division of water resources' map titled "normal annual precipitation, by township, 1961-1990," dated September 29, 1999, is hereby adopted by reference for the purpose of determining average annual precipitation.

(b) The data on the map shall be used in all situations in which the determination of average annual precipitation is necessary, including calculating the maximum annual quantity of water allowed to be appropriated for the storage of surface water in a reservoir.

(c) The values shown on the map shall be used unless the applicant provides, or the chief engineer has available, better or more site-specific data concerning average annual precipitation. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 1999 Supp. 82a-711; effective Sept. 22, 2000.)

5-6-13. Water level measurement tube specifications. (a) The Kansas department of agriculture, division of water resources' document titled "specifications for water level measurement tube," dated November 5, 1999, is hereby adopted by reference.

(b) If a water level measurement tube is required by the chief engineer to be installed, the required water level measurement tube shall be installed in accordance with the specifications for water level measurement tubes adopted by the chief engineer. These requirements are in addition to those made by the Kansas department of health and environment pursuant to the groundwater exploration and protection act, K.S.A. 82a-1201 et seq., and amendments thereto.

(c) As long as the well is permitted, the water level measurement tube shall be maintained in a satisfactory condition. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706c; effective Sept. 22, 2000.)

5-6-13a. Check valve specifications. The Kansas department of agriculture, division of water resources' document titled "check valve specifications," dated March 14, 2003, is hereby adopted by reference. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706, K.S.A. 82a-706a, and K.S.A. 82a-712; effective Oct. 24, 2003.)

5-6-14. Irrigation with effluent from a confined feeding facility lagoon. An individual who irrigates with effluent pumped from a confined feeding facility lagoon or runoff retention pit shall not be required to have an approval of application pursuant to K.S.A. 82a-701 et seq. and amendments thereto, unless there are more than 15 acre-feet of average annual runoff meeting the following criteria:

(1) Is generated from outside of the confined feeding facility;

(2) is impounded in the lagoon or runoff retention pit; and

(3) is used for irrigation purposes. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-705 and 82a-707(a); effective Sept. 22, 2000.)

5-6-15. Drainage basin boundaries. (a) The following electronic data files, all dated February 14, 2002, prepared by the division of water resources, Kansas department of agriculture, using data developed by the United States geological survey and the natural resource conservation service, are hereby adopted by reference by the chief engineer for the purpose of defining the boundaries of the 62 drainage basins in Kansas:

(1) dwrbasins.dbf;

(2) dwrbasins.sbn;

(3) dwrbasins.sbx;

(4) dwrbasins.shp; and

(5) dwrbasins.shx.

(b) The electronic data files described in subsection (a) shall be used in all situations in which determination of the basin boundaries is necessary.

(c) The boundaries shown in the electronic data files shall be used unless the applicant provides, or the chief engineer has available, better or more site-specific data concerning the actual drainage basin boundaries. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706 and K.S.A. 82a-706a; effective Sept. 22, 2000; amended Oct. 24, 2003.)

Article 7.—ABANDONMENT AND TERMINATION

5-7-1. Due and sufficient cause for nonuse. (a) Each of the following circumstances shall be considered "due and sufficient cause," as used in K.S.A. 82a-718, and amendments thereto:

(1) Adequate moisture is provided by natural precipitation for production of crops normally requiring full or partial irrigation within the region of the state in which the place of use is located.

(2) A right has been established or is in the process of being perfected for use of water from one or more preferred sources in which a supply is available currently but is likely to be depleted during periods of drought.

(3) Water is not available from the source of water supply for the authorized use at times needed.

(4) Water use is temporarily discontinued by the owner for a definite period of time to permit soil, moisture, and water conservation, as documented by any of the following:

(A) Furnishing to the chief engineer a copy of a contract showing that land that has been lawfully irrigated with a water right that has not been abandoned is enrolled in a multiyear federal or state conservation program that has been approved by the chief engineer;

(B) enrolling the water right in the water right conservation program in accordance with K.A.R. 5-7-4; or

(C) any other method acceptable to the chief engineer that can be adequately documented by the owner before the nonuse takes place.

(5) Management and conservation practices are being applied that require the use of less water than authorized. If a conservation plan has been required by the chief engineer, the management and conservation practices used shall be consistent with the conservation plan approved by the chief engineer to qualify under this subsection.

(6) The chief engineer has previously approved the placement of the point of diversion in a standby status in accordance with K.A.R. 5-1-2.

(7) Physical problems exist with the point of diversion, distribution system, place of use, or the operator. This circumstance shall constitute due and sufficient cause only for a period of time reasonable to correct the problem.

(8) Conditions exist beyond the control of the owner that prevent access to the authorized place of use or point of diversion, as long as the owner is taking reasonable affirmative action to gain access.

(9) An alternate source of water supply was not needed and was not used because the primary source of supply was adequate to supply the needs of the water right owner. The owner shall maintain the diversion works on the alternate source of supply in a condition that will allow the owner to effectively use the alternate source of supply in a timely manner.

(10) The chief engineer determines that a manifest injustice would result if the water right were deemed abandoned under the circumstances of the case.

(b) In order to constitute due and sufficient cause for nonuse of water, the reason purporting to constitute due and sufficient cause shall have in fact prevented, or made unnecessary, the authorized beneficial use of water.

(c) Each year of nonuse for which the chief engineer finds that due and sufficient cause exists shall be considered to interrupt the successive years of nonuse for which due and sufficient cause does not exist.

(d) When a verified report of the chief engineer, or the chief engineer's authorized representative, is made a matter of record at a hearing held pursuant to K.S.A. 82a-718, and amendments thereto, that establishes nonuse of a water right for five or more successive years, the water right owner shall have the burden of showing that there have not been five or more successive years of nonuse without due and sufficient cause. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-718; modified, L. 1978, ch. 460, May 1, 1978; amended May 1, 1986; amended May 31, 1994; amended Oct. 24, 2003.)

5-7-2. Waiver of hearing. The owner of a water right may waive any hearing on the questions of abandonment and termination of such right by letter to the chief engineer requesting that it be terminated and its priority forfeited. In the event of such waiver the chief engineer shall cause the termination and forfeiture of priority date to be made a matter of record in his office and shall notify the owner of the water right of his or her action by regular mail. (Authorized by K.S.A. 82a-706a; modified, L. 1978, ch. 460, May 1, 1978.)

5-7-3. (Authorized by K.S.A. 82a-706a; modified, L. 1978, ch. 460, May 1, 1978; revoked May 31, 1994.)

5-7-4. Water rights conservation program. (a) Enrollment in the water rights conservation program (WRCP) approved by the chief engineer, and continued compliance with the WRCP shall constitute due and sufficient cause for nonuse pursuant to K.S.A. 82a-718, and amendments thereto, and K.A.R. 5-7-1 during the time the water right is enrolled in the WRCP.

(b) In order to qualify for enrollment in the WRCP, the following conditions shall be met:

(1) The point of diversion shall be located in either of the following locations:

(A) In an area that is closed to new appropriations of water, except for temporary permits, term permits, and domestic use; or

(B) in some other area designated by the chief engineer as an area where it would be in the public interest to allow water rights to be placed in the WRCP. In areas within the boundaries of a groundwater management district, the recommendations of the board of the district shall be taken into consideration by the chief engineer.

(2) Each of the owners of the water right shall agree to totally suspend all water use authorized by that water right for the duration of the contract.

(3) The owner or owners of the water right shall sign a contract with the chief engineer, or the chief engineer's authorized representative, before placing the water right into the WRCP. The contract shall be binding on all successors in interest to the water right owner.

(4) Only an entire water right may be placed into the WRCP. If a portion of a water right has been abandoned, the portion that is still in good standing may be enrolled in the WRCP. If a water right is administratively divided by the chief engineer, each portion of a formally divided water right shall be considered to be an entire water right for the purpose of this regulation.

(A) If at least five successive years of nonuse have occurred before application for enrollment in the WRCP, a determination of whether or not that water right is subject to abandonment before entry into the program, including an analysis of any reasons given that might constitute due and sufficient cause for nonuse, shall be made by the chief engineer.

(B) If, after review of the information, it appears that the right has been abandoned, the statutory procedures, including the right to a hearing, shall be followed to determine whether or not it has been abandoned.

(5) Only the portion of a water right in good standing at the time of application for enrollment may be entered into the WRCP.

(c) Other obligations, responsibilities, and aspects of enrollment in the WRCP program shall include the following:

(1) Water rights shall originally be placed into the WRCP for a definite period of calendar years of no fewer than five and no more than ten. The owner of the water right may apply for renewal of the contract for a period not to exceed 10 years. Applications for renewal shall be subject to the approval of the chief engineer. In determining whether or not to approve the renewal, the following factors shall be taken into account by the chief engineer:

(A) The hydrologic conditions in the vicinity of the point of diversion;

(B) the effect of renewal on the public interest; and

(C) any other relevant information.

(2) The water right owner or operator shall not be required to maintain the diversion works or delivery system during the period of the WRCP contract. If the pump is removed from a well, the well shall be properly capped or sealed during the contract. These requirements are in addition to those made by the Kansas department of health and environment pursuant to the groundwater exploration and protection act, K.S.A. 82a-1201 et seq., and amendments thereto.

(3) A certificate determining the extent to which a water right has been perfected shall be issued by the chief engineer before entering the water right into the WRCP if all of the following conditions are met:

(A) An applicant has a permit to appropriate water for beneficial use and has perfected all, or any portion, of the water right authorized by the permit.

(B) The time in which to perfect the water right has expired, including any authorized extensions of time.

(C) A field inspection has been completed.

(4) If the time to perfect the water right, or any authorized extension of it, has not expired, enrollment in the WRCP shall be considered as suspending the time to perfect. Upon expiration of the WRCP contract pertaining to this water right, the time to perfect shall again commence, and the applicant shall be required to perfect the water right within the remainder of the time allowed to perfect, or any authorized extension of that time.

(5) Each year after authorized enrollment in the WRCP, the water use correspondent shall indicate on the water use report that no water was used because the water right was enrolled in the WRCP.

(6) If the owner breaches, or causes or allows a breach of, the WRCP contract with the chief engineer, each year of nonuse between the effective date of the contract and the date of the breach shall be counted as years of non use without due and sufficient cause for the purpose of determining whether or not the water right has been abandoned pursuant to the provisions of K.S.A. 82a-718, and amendments thereto. Before this penalty is imposed, the owner shall be given an opportunity to show either of the following:

(A) A breach of contract did not occur.

(B) A breach occurred, but either was minor or has been cured, and should not constitute grounds for imposing the penalty. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706, K.S.A. 82a-713, K.S.A. 1999 Supp. 82a-714, and K.S.A. 1999 Supp. 82a-718; effective July 1, 1994; amended Sept. 22, 2000.)

5-7-4a. Conservation reserve program. (a) Enrollment of all, or part of, the authorized place of use in the conservation reserve program (CRP) shall not be considered good cause to extend the time to construct the diversion works.

(b) If an authorized place of use has been placed into the CRP after the diversion works have been completed but before the time to perfect the water right has expired, the appropriator may request and receive an extension of time to perfect the water right for the length of time that the authorized place of use is enrolled in the CRP program, plus the length of time remaining to perfect the water right, if all of the following conditions are met:

(1) The diversion works were properly completed within the time allowed by the approval of application.

(2) The time to perfect the water right as set forth in the approval of the application has not expired at the time the request for the extension is filed.

(3) The appropriator furnishes the chief engineer with a copy of the CRP contract, including the aerial photograph designating which land has been placed into the CRP program. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-713 and K.S.A. 1999 Supp. 82a-714; effective Sept. 22, 2000.)

5-7-5. Reduction of an existing water right. (a) In order to have an approval of application or water right reduced, the water right owner may file, at any time, a request to reduce any of the following:

(1) The authorized maximum annual quantity of water;

(2) the authorized maximum rate of diversion;

(3) the authorized place of use;

(4) the authorized points of diversion;

(5) the types of beneficial use; or

(6) any combination of paragraphs (a)(1) through (a)(5).

(b) The request to reduce a water right shall be filed on a form prescribed by the chief engineer.

(c) The request to reduce shall be submitted in

proper form and shall include the following information:

(1) Except as set forth in subsection (d) below, notarized signatures of all water right owners that would be required by K.A.R. 5-5-1 to sign an application for change under K.S.A. 82a-708b and amendments thereto;

(2) a clear description of which portion or portions of the approval of application or water right are proposed to remain;

(3) a statement that all of the owners of the approval of application or water right are waiving any right they might have to a hearing concerning the dismissal or abandonment of any portion of the approval of application or water right that they are requesting to have removed; and

(4) any other information requested by the chief engineer.

(d) A request solely to reduce the authorized place of use that will not affect the approval of application or water right in any other way shall be only required to be signed only by all of the owners of the authorized place of use that is proposed to be deleted.

(e) A reasonable request to reduce an approval of application or water right that is submitted in proper form shall be approved by the chief engineer unless it will cause the impairment of existing water rights or prejudicially and unreasonably affect the public interest. If the request to reduce the water right or approval of application is to remove a point of diversion, the approval shall reduce only that maximum annual quantity of water and maximum rate of diversion associated with the authorized point of diversion that is removed.

(f) A request to reduce an existing water right shall not be considered to be an application for a change pursuant to K.S.A. 82a-708b and amendments thereto, so no application fee shall be required. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706 and 82a-721; effective Sept. 22, 2000.)

Article 8.—CERTIFICATION OF WATER RIGHTS

5-8-1. Certification of a water right. Prior to the issuance of a certificate of appropriation by the chief engineer pursuant to an application under which water has been applied to the land of more than one owner, these landowners shall be allowed an opportunity to submit to the chief engineer an agreement signed by all landowners involved recommending how the water right should be divided among them. (Authorized by K.S.A. 82a-706a, 82a-714; effective May 1, 1980.)

5-8-2. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-712, 82a-714; effective May 1, 1980; revoked May 1, 1981.)

5-8-3. Perfection; multiple water rights. (a) The total maximum annual quantity of water that can be perfected by all water rights authorized to divert water to the same authorized place of use, shall be limited to the maximum quantity of water actually physically and legally diverted and applied to beneficial use on the common authorized place of use during any one calendar year during the perfection period for the water right being certified.

(b) The junior water right shall be limited by means of a limitation clause in the certificate so that the authorized annual quantity of water for the junior water right, when combined with all senior water rights authorized to apply water to beneficial use on the common authorized place of use, does not exceed either of the following standards:

(1) The annual quantity of water reasonable for the type of beneficial use made of the water; and

(2) the total annual quantity of water legally diverted by all water rights to the common authorized place of use during any one calendar year during the perfection period of the junior water right.

(c) The limitation clause on the junior water right being certified shall not restrict the total annual quantity authorized to be diverted to the authorized place of use to less than the total annual quantity of water authorized by the senior water right or water rights for beneficial use on the common authorized place of use.

(d) The owner whose water right is being certified shall be sent a draft certificate showing the maximum rate of diversion and maximum annual quantity of water that are being proposed for the certificate. The water right owner shall be given a reasonable time period of no fewer than 30 days to comment on the draft certificate and to provide any additional information concerning the water diverted and applied to beneficial use on the authorized place of use during the perfection period in accordance with the terms, conditions, and limitations of the approval of application, and all other water rights and approvals of applications

authorized to divert water to the common authorized place of use.

(e) In certifying a water right with a priority date before the effective date of this regulation, the provisions of subsection (a) shall be followed to the extent possible. If sufficient information is not available to make the determination described in subsection (a), the best information available shall be utilized by the chief engineer to determine the quantity of water applied to the authorized place of use during any one calendar year during the perfection period under the authority of the approval of application being certified and all other water rights. The standard set forth in paragraph (b)(1) shall be applied, even if sufficient information is not available to make the determination described in subsection (a). (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-707(e), K.S.A. 82a-713, and K.S.A. 1999 Supp. 82a-714(a); effective Sept. 22, 2000.)

5-8-4. Construction of diversion works. (a) A reasonable period of time for construction of diversion works shall be not less than one full year following the approval of the application to appropriate water. If a person demonstrates that a reasonable long-term schedule for development of diversion works or other infrastructure is in the public interest, that information shall be taken into consideration by the chief engineer in determining a reasonable period of time for the construction of diversion works.

(b) For good cause shown by the applicant, a reasonable extension of time to construct the diversion works shall be allowed by the chief engineer, if the request for extension is filed pursuant to the requirements of K.A.R. 5-3-7 and is accompanied by the statutorily required filing fee.

(c) If the total time allowed to construct the diversion works has been more than 16 months and fewer than 24 months, an extension of time shall be granted by the chief engineer only if the applicant meets the following criteria:

(1) Demonstrates good cause;

(2) provides a copy of a contract with the well driller or other information substantiating the intent to proceed to complete the construction of the diversion works in an expeditious manner;

(3) files the request for extension pursuant to the requirements of K.A.R. 5-3-7; and

(4) submits the statutorily required filing fee.

(d) If the total time allowed to construct the diversion works equals or exceeds 24 months, an extension of time may be granted only if the applicant demonstrates to the chief engineer that circumstances beyond the control of the applicant necessitate the extension of time.

(e)(1) The applicant shall file a notice of completion of diversion works and the statutorily required field inspection fee with the chief engineer no later than March 1 following the deadline to construct the diversion works. The notice of completion of diversion works shall be filed on a form prescribed by the chief engineer.

(2) If a water flowmeter has been required by the chief engineer as a condition of the permit, the applicant shall also file a notice of completion of installation of a water flowmeter on a form prescribed by the chief engineer. This form shall be due at the same time that the notice of completion of diversion works form is due.

(f)(1) The applicant shall be sent a notice by the chief engineer giving the applicant 30 days to show that the diversion works were completed within the time allowed in accordance with the terms, conditions, and limitations of the approval of application and to pay the field inspection fee, if it has not already been paid, under either of the following conditions:

(A) A notice of completion of diversion works has not been completely and timely filed with the chief engineer.

(B) Information on file in the office of the chief engineer indicates that the diversion works were not properly constructed within the time allowed to construct the diversion works, including any authorized extensions of time.

(2) The permit shall be dismissed and its priority forfeited if the applicant fails to perform the following:

(A) To demonstrate that the diversion works were completed within the time allowed by the approval of application; and

(B) to pay the statutorily required field inspection fee, if it has not already been paid. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-712, K.S.A. 82a-713, and K.S.A. 1999 Supp. 82a-714; effective Sept. 22, 2000.)

5-8-6. Perfection of a water right. (a) Except for municipal use, a reasonable period of time to perfect a water right shall be no fewer than four full calendar years following the deadline for construction of the diversion works. If the time to construct the diversion works is extended, the perfection period shall be extended to no fewer than

four full calendar years beyond the final deadline to construct the diversion works, unless the owner of the approval of application objects.

(b) A reasonable time to perfect a water right for municipal use shall be no fewer than 20 full calendar years plus the remainder of the calendar year in which the application was approved. Each holder of a permit for municipal use of water shall submit a progress report to the chief engineer 10 full calendar years after the permit was issued. The report shall be submitted on a form prescribed by the chief engineer. The report shall meet the following conditions:

(1) Compare the annual water use projected in the original application with the actual annual water use for the prior 10 years; and

(2) document compliance with an approved conservation plan, if one had been required. If the 10-year review by the chief engineer shows that actual annual water use is significantly less than originally projected, the holder shall revise the estimated annual water use for the next 10 years. If it is in the public interest, the total authorized annual quantity of water for the next 10 years shall be reduced by the chief engineer to a reasonable annual quantity based on the municipal user's revised estimates of annual water use for the next 10 years. If the 10-year review indicates that a required conservation plan was not being complied with or that the conservation plan does not meet the Kansas water office's conservation guidelines for municipal users, as in effect at the time of the review, an order requiring any of the following shall be issued by the chief engineer:

(A) That the conservation plan be amended to comply with current guidelines;

(B) that the user comply with the provisions of the approved conservation plan; or

(C) both of the requirements in paragraphs (b)(2)(A) and (B).

(c) If the applicant demonstrates to the chief engineer that a longer perfection period is necessary to justify purchase or construction of infrastructure related to the diversion, treatment, or distribution of water that actually is being built, the original time to perfect a water right for municipal use or other public entity, including a utility, may be extended for a period not to exceed a total time to perfect of 40 years.

(d) For good cause shown by the applicant, a reasonable extension of time to perfect a water right shall be allowed by the chief engineer if the request for extension is filed pursuant to the terms of K.A.R. 5-3-7 and is accompanied by the statutorily required filing fee.

(e) If water use reports and other information on file in the office of the chief engineer indicate that no water was applied to the authorized beneficial use during the time allowed to perfect the water right, including any authorized extensions of time, the owner of the approval of application as shown in the records of the chief engineer shall be sent a notice by the chief engineer, giving the owner 30 days to show that water was put to beneficial use within the terms, conditions, and limitations of the permit during the perfection period. If the owner fails to demonstrate that water was so used, the permit shall be dismissed and its priority forfeited. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-707(e), K.S.A. 82a-712, K.S.A. 82a-713, and K.S.A. 1999 Supp. 82a-714; effective Sept. 22, 2000.)

5-8-7. Extensions of time to perfect a water right. (a) For all beneficial uses of water, except municipal use, the total time to perfect the water right, including extensions of time, shall not exceed 10 years after the calendar year in which the diversion works were required to be completed unless one or more of the following "extenuating circumstances" exist.

(b) "Extenuating circumstances" shall include the following:

(1) Circumstances beyond the control of the owner of the approval of application that have unduly restricted the owner's ability to perfect the water right;

(2) actions or omissions by the chief engineer that make it necessary to extend the time to perfect; and

(3) for applications with a priority before May 1, 1978, the unavailability or lack of credibility of records of water use, crops grown, and the number and location of acres actually irrigated, and other relevant information during the perfection period, but other records or information is available for a period after the perfection period and would reasonably represent the application of water to beneficial use in accordance with the terms, conditions, and limitations of the permit.

(c) The burden shall be on the owner of the approval of application to document the extenuating circumstances described in subsection (b) and justify to the chief engineer the need for the extension of time to perfect the water right.

(d)(1) Extensions of time to perfect for appli-

cations with a priority before May 1, 1978, may be granted in any reasonable increment of years. The total amount of time allowed to perfect the water right shall be reasonable.

(2) Extensions of time to perfect a water right for nonmunicipal use, with a priority on or after May 1, 1978, may be granted in any increment of time until the total time to perfect equals 10 years. After the total time allowed to perfect the water right equals 10 years, extensions of time shall be granted in one-year increments only.

(e) Extensions of the time to perfect a water right for municipal use of water that can be justified shall be extended in five-year increments or less after the original 20-year time period to perfect the water right has elapsed. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-712 and 82a-713; effective Sept. 22, 2000.)

5-8-8. Owner required to allow chief engineer to conduct timely field inspection for certification. (a) In order to allow the chief engineer to conduct a timely field inspection to certify a water right, the owner of an approval of application shall perform the following:

(1) Operate the diversion works in the same manner that they were operated when water was applied to beneficial use during the perfection period, so that an accurate rate-of-diversion test can be conducted by the chief engineer;

(2) allow the chief engineer access to the diversion works and the authorized place of use for the purpose of making the field inspection; and

(3) allow, cooperate with, and assist the chief engineer in any other ways necessary for the chief engineer to conduct the field inspection.

(b) The owner of the approval of application shall allow the field inspection to be conducted within 365 days after the chief engineer has sent the owner of the approval of application a restricted letter requesting that the chief engineer be allowed to conduct a field inspection. If the owner does not cooperate with, assist, and allow the chief engineer to conduct a field inspection, without good cause, within one year after the restricted letter is sent by the chief engineer, an order shall be issued by the chief engineer requiring the owner of the approval of application to comply with the terms of the restricted letter. The order shall also be sent by restricted mail. If the owner fails to comply with the order of the chief engineer, an action shall be brought by the chief engineer to enforce the order of the chief engineer pursuant to the act for judicial review, and civil enforcement of agency actions, K.S.A. 77-624 et seq. and amendments thereto. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 1999 Supp. 82a-714; effective Sept. 22, 2000.)

Article 9.—TEMPORARY PERMITS

5-9-1. Application for temporary permit acceptable for filing. To be acceptable for filing, an application for temporary permit to appropriate water for beneficial use shall meet the following requirements: (a) Be made on the form prescribed by the chief engineer;

(b) be signed by the applicant or an authorized representative of the applicant;

(c) be accompanied by the statutory application fee;

(d) contain all the information requested for the proposed use as set forth in the prescribed application form; and

(e) include any other information requested by the chief engineer that is necessary to understand the application. (Authorized by and implementing K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-727; effective May 1, 1979; amended Oct. 24, 2003.)

5-9-2. Priority. Upon receipt in the office of the chief engineer of an acceptable application for temporary permit to appropriate water, accompanied by the statutory application fee, a stamp showing the date and time of receipt shall be placed on the application form. The date and time of receipt of the application shall establish the priority to the use of the water. The priority shall terminate on the date when use of water will be discontinued as set forth in the application or any authorized extension of time thereof. (Authorized by K.S.A. 82a-727; effective May 1, 1979.)

5-9-3. Quantity. A temporary permit shall not be granted for a quantity in excess of 1,000,000 gallons except for dewatering purposes or when water is to be diverted from a source located on a construction site and used on the construction site in connection with a project that the chief engineer has approved under the authority of K.S.A. 82a-301 through 305a or K.S.A. 24-126. (Authorized by K.S.A. 82a-727b; implementing K.S.A. 82a-727; effective May 1, 1979; amended Dec. 3, 1990.)

5-9-4. Place of use limitation. A temporary permit shall not be granted for more than one

place of use. (Authorized by K.S.A. 82a-727; effective May 1, 1979.)

5-9-5. Point of diversion limitation. A temporary permit shall not be granted authorizing more than one point of diversion from any source of supply. (Authorized by K.S.A. 82a-727; effective May 1, 1979.)

5-9-6. Approval of application. The approval of an application for a temporary permit shall be by endorsement on the application by the chief engineer. The endorsement shall set forth the terms, limitations, and conditions necessary for the protection of the public interest. (Authorized by and implementing K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-727; effective May 1, 1979; amended Oct. 24, 2003.)

5-9-7. Extension of time. For good cause shown by the applicant the chief engineer may grant an extension of time to continue the use of water under a temporary permit beyond the date authorized as shown in the approval of the application. The term of a temporary permit shall not exceed six (6) months including any authorized extension of time thereof. (Authorized by K.S.A. 82a-727; effective May 1, 1979.)

5-9-8. Ownership. A temporary permit for the appropriation of water shall not be transferable. (Authorized by K.S.A. 82a-727; effective May 1, 1979.)

5-9-9. Reserved.

5-9-10. Application fee for a temporary permit. The fee for an application for a temporary permit or extension of a temporary permit shall be twenty-five dollars ($25.00). This regulation shall be effective on and after September 1, 1982. (Authorized by and implementing K.S.A. 1982 Supp. 82a-727; effective, T-83-25, Sep. 1, 1982; effective May 1, 1983.)

5-9-11. Documentation of access to source of water supply for temporary permit. Before approval of a temporary permit, the applicant shall show that permission for access to the source of water supply has been obtained from the landowner or landowners of the property where the proposed point of diversion will be located. If permission is granted in an oil and gas lease, it shall be sufficient for the applicant to indicate this on the application for a temporary permit to appropriate water. If the water is to be obtained from land not covered by the oil and gas lease, then the permission of the landowner or landowners shall be adequately documented. (Authorized by and implementing K.S.A. 82a-727; effective Sept. 22, 2000.)

Article 10.—WATER APPROPRIATION

5-10-1. (Authorized by K.S.A. 82a-706a, K.S.A. 1982 Supp. 82a-708a; implementing K.S.A. 1982 Supp. 82a-708a; effective, T-83-25, Sep. 1, 1982; effective May 1, 1983; revoked May 1, 1988.)

5-10-2. (Authorized by K.S.A. 82a-706a, K.S.A. 1982 Supp. 82a-708a; implementing K.S.A. 1982 Supp. 82a-708a; effective, T-83-25, Sep. 1, 1982; effective May 1, 1983; revoked May 1, 1988.)

5-10-3. (Authorized by K.S.A. 82a-706a, K.S.A. 1982 Supp. 82a-708b; implementing K.S.A. 1982 Supp. 82a-708b; effective, T-83-25, Sep. 1, 1982; effective May 1, 1983; revoked May 1, 1988.)

5-10-4. Waiver or exemptions. The chief engineer may grant an exemption or waiver from any regulation adopted by the chief engineer if it is shown that the granting of such exemption or waiver will not prejudicially nor unreasonably affect the public interest and that it will not impair an existing water right. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-711, 82a-712; effective May 1, 1983.)

5-10-5. Administration of water use among vested right holders. If, during the administration of water rights, each appropriation right and approved permit to appropriate water for beneficial use has been regulated in accordance with the provisions of K.S.A. 82a-706b, the division of water resources shall administer the water available from that source of supply among the holders who have active vested rights, including vested rights for domestic purposes, on a proportional basis and in a manner which will provide, if possible, sufficient flow in the stream for vested rights for domestic purposes. The proportionment may be accomplished by a pro rata reduction in the rate or quantity that each vested right shall be allowed to divert, by setting up a rotation system or by any other equitable method. Vested rights shall be administered in this manner unless they have been adjudicated by a court of

competent jurisdiction as to priority or rotation and then the chief engineer shall administer them in accordance with the order of the court. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-704a and K.S.A. 82a-706; effective May 1, 1986.)

5-10-6. Procedure for determination of an active vested domestic water right. The existence of an active domestic vested water right shall be determined by the chief engineer as follows:

(a) Information shall be filed with the chief engineer on a form prescribed by the chief engineer concerning the dates beneficial use of water was made, and the nature and extent of the active domestic vested right.

(b) Affidavits from at least three competent disinterested persons shall be filed by the claimant on a form prescribed by the chief engineer or other reliable substantiating evidence shall be submitted to the chief engineer by the claimant documenting the dates beneficial use of water was made, and the nature and extent of the active domestic vested right.

(c) Within a reasonable time, the staff of the division of water resources shall investigate the information submitted.

(d) Notice.

(1) Written notice of the claim shall be sent by the chief engineer to all water right owners of record in the office of the chief engineer with an authorized point of diversion within one-half mile of the claimed point of diversion.

(2) In addition, one notice in a newspaper with general circulation in the county in which the point of diversion is located shall be published by the chief engineer. Such published notice shall contain:

(A) the name of the claimant;

(B) the location of the claimed point of diversion; and

(C) a declaration that it is a claim for a domestic vested right.

(3) All notices shall be given at least 14 days prior to the close of the record.

(e) A copy of the chief engineer's draft order determining the active domestic vested water right and any comments received in response to the notices shall be furnished to the claimant by the chief engineer or the chief engineer's authorized representative.

(f) The claimant shall be given thirty days from the date the chief engineer mails the draft to the claimant in which to submit additional information, request a hearing concerning the determination, or both.

(g) If a hearing is requested by the claimant in a timely manner, or the chief engineer deems it to be in the public interest to do so, a hearing shall be held by the chief engineer, or the chief engineer's authorized representative, within a reasonable time.

(h) The chief engineer shall issue the order determining whether the claimed active vested domestic right exists and, if so, determining the nature and extent of that right.

(i) The order determining the active vested domestic right shall be made a matter of record in the office of the chief engineer. In addition, a copy of the order shall be furnished to the claimant by the chief engineer, with instructions that it shall be filed with the register of deeds in the county in which the point of diversion is located.

(j) All vested domestic water rights shall be assumed to have a priority of June 28, 1945 until they have been adjudicated by a court of competent jurisdiction. Vested domestic rights shall be administered in accordance with K.A.R. 5-10-5. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-705a; effective Nov. 28, 1994.)

Article 11.—ASSURANCE DISTRICTS

5-11-1. Definitions. As used in these rules and regulations and the water assurance program act by the division of water resources in the administration of the water assurance program act, unless the context clearly requires otherwise, the following words and phrases shall have the meaning ascribed to them in this section.

(a) "Board" means the board of directors of a water assurance district.

(b) "Chief engineer" means the chief engineer of the division of water resources of the Kansas state board of agriculture. (Authorized by K.S.A. 82a-1345(e); implementing K.S.A. 82a-1334; effective May 31, 1994.)

5-11-2. Determination of benefits. (a) A water assurance district member may apply in writing to the board to be removed as a member of the district if that member is no longer receiving benefits from supplementing the stream by assurance reservoir releases because:

(1) the member no longer has a water right or permit; or

(2) the member's water right or permit has been reduced so that the member is no longer receiving benefits.

(b) The board shall forward the request to be removed as a member from the district to the chief engineer, who shall determine whether the member will be receiving benefits. The chief engineer shall forward the results of that determination to the board in writing within a reasonable time.

(1) If the chief engineer determines that the member will continue to receive benefits, the chief engineer shall notify the board and the member's application to be removed shall be dismissed by the board.

(2) If the chief engineer determines that the member will no longer be receiving benefits, the chief engineer shall notify the board and it shall be determined by the board whether the member will be removed from the district and the terms of removal. (Authorized by K.S.A. 82a-1345(e); implementing K.S.A. 82a-1334; effective May 31, 1994.)

Article 12.—AQUIFER STORAGE AND RECOVERY

5-12-1. Aquifer storage and recovery permitting. (a) An operator may store water in an aquifer storage and recovery system under a permit to appropriate water for artificial recharge if the water appropriated is source water. The requirements of article 12 of the rules and regulations adopted by the Kansas department of agriculture, division of water resources are in addition to any requirements of the Kansas department of health and environment concerning underground injection wells, including article 46 of the rules and regulations adopted by the Kansas department of health and environment.

(b) Each application for a permit to appropriate water for artificial recharge shall describe the horizontal and vertical extent of the basin storage area in which the source water will be stored.

(1) The horizontal extent shall be determined by a closed boundary within which the recharge system used to store the water will be physically located. The recharge system may include recharge pits, recharge trenches, recharge wells, or other similar systems that cause source water to enter the storage volume of the basin storage area, either by gravity flow or by injection. The basin storage area may be subdivided into smaller areas representative of the areas that may be recharged by the individual recharge systems.

(2) The vertical extent shall be defined by a minimum and a maximum index water level for the basin recharge storage area, or for each subdivided area within the basin storage area if the basin storage area is subdivided. The minimum index water level shall be the lowest water level within the basin storage area, or smaller subdivided area if the basin storage area is subdivided, that occurred within the 10 years before the filing of the application for a permit to appropriate water, or a period of time longer than 10 years demonstrated by the applicant to reflect the lowest water level. If the basin storage area is subdivided, measurements from the same year shall be used to determine the minimum index water level for each subdivision. The maximum index water level shall represent the maximum storage potential for the basin storage area.

(c) An application for a permit to appropriate water for artificial recharge shall set forth the maximum annual quantity and maximum rate of diversion of source water.

(d) (1) Each application for a permit to appropriate water for artificial recharge shall include a methodology for accounting for water stored in a basin storage area both on an annual basis and on a cumulative basis so that recharge credits can be calculated. If more than one application for a permit to appropriate water for artificial recharge relates to the same aquifer storage and recovery system, each application shall use the same methodology for accounting for water stored in the basin storage area. The accounting of the water balance of all water entering and leaving the basin storage area shall be determined by using sound engineering methods based on actual measurements, generally accepted engineering methodology, or a combination of both.

(2) Approval of any application for a permit to appropriate water for artificial recharge shall be contingent upon the chief engineer's approval of the method for accounting for the basin storage area.

(e) An applicant for recovery of water stored by the holder of a permit to appropriate water for artificial recharge to store water in a basin storage area shall obtain a permit separate from the aquifer storage permit to appropriate water for beneficial use for each well used to recover the water stored. The maximum annual quantity of water that may be appropriated for this purpose shall be

no more than the maximum cumulative recharge credits available to the operator of the aquifer storage and recovery system. These credits shall be determined by the accounting methodology approved under a permit to appropriate water for artificial recharge pertaining to the aquifer storage and recovery system. In determining whether diversion of the annual quantity impairs other water rights, the following data may be considered by the chief engineer:

(1) The maximum storage volume available in the basin storage area;

(2) the spatial distribution of recharge and withdrawal systems;

(3) the maximum rate of diversion at which the water will be withdrawn; and

(4) any other relevant information.

Recharge credits may be accumulated over more than one year, and any amount of recharge credits available may be withdrawn in accordance with the permit if the withdrawal does not impair other water rights.

(f) The approval of application, if the water to be diverted is the water artificially recharged into the basin storage area, shall be conditioned upon the following:

(1) Generally accepted engineering methodology;

(2) a maximum annual quantity that does not exceed the recharge credits; and

(3) an annual reporting that complies with K.A.R. 5-12-2. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 1999 Supp. 82a-711 and K.S.A. 82a-712; effective Sept. 22, 2000.)

5-12-2. Aquifer storage and recovery accounting. (a) In addition to annual water use reporting requirements pursuant to K.S.A. 82a-732, and amendments thereto, on June 1 of each year the permit holder of an aquifer storage or recovery system shall report an accounting of water in the basin storage area to the chief engineer and to any groundwater management district identified in subsection (c) of this regulation. The annual report for the preceding calendar year shall account for all water entering and leaving the basin storage area and shall specifically compute the amount of recharge credits held in the basin storage area.

(b) The report shall be in the form prescribed by the chief engineer and shall address the items in the water balance for the basin storage area, which may include the following amounts:

(1) Natural and artificial recharge;

(2) groundwater inflow and outflow;

(3) evaporation and transpiration;

(4) groundwater water diversions from all nondomestic wells;

(5) infiltration from streams;

(6) groundwater discharge to streams;

(7) the calculated recharge credits; and

(8) any other information that in the opinion of the chief engineer is pertinent to the basin storage and surrounding areas.

The annual accounting shall specifically take into account the amounts of natural recharge, artificial recharge, groundwater inflow, groundwater outflow, evapotranspiration, and groundwater pumpage. Groundwater pumpage shall include recharge credits withdrawn as well as pumpage from all nondomestic wells in the basin storage area. The annual accounting shall include any additional items within a basin storage area that would be necessary to determine the amount of recharge credit available for recovery.

(c) If any part of the basin storage area is within the boundaries of a groundwater management district, the permit holder of any aquifer storage or recovery system shall furnish a copy of the annual report to the district board for comments by June 1 of each year.

(d) If a groundwater management district receives an annual report, the district may provide comments to the chief engineer if the comments are submitted to the chief engineer within 30 days of the district's receipt of the report identified in subsection (c) of this regulation.

(e) The permit holder may be required by the chief engineer to submit additional information pertinent to the system. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 1999 Supp. 82a-711 and K.S.A. 82a-712; effective Sept. 22, 2000.)

5-12-3. Hearings. (a) A hearing shall be held by the chief engineer in the general vicinity where an applicant proposes aquifer storage and recovery before approval of any such application for aquifer storage and recovery.

(b) If any part of a proposed basin storage area is within the boundaries of a groundwater management district, the hearing required by subsection (a) of this regulation shall be held within the groundwater management district. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 1999 Supp. 82a-711 and K.S.A. 82a-712; effective Sept. 22, 2000.)

5-12-4. Aquifer storage and recovery systems in a groundwater management district. A groundwater management district may recommend rules and regulations pertaining to monitoring and accounting requirements for that portion of the basin storage area that falls within the district's boundaries. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 1999 Supp. 82a-711, K.S.A. 82a-712, and K.S.A. 82a-1028(o); effective Sept. 22, 2000.)

Article 13.—SAND AND GRAVEL PIT OPERATIONS

5-13-1. Notice of intent to open or expand a sand and gravel pit operation. Each operator desiring to open or expand a sand and gravel pit operation shall file a notice of intent to open or expand a sand and gravel pit operation on a form prescribed by the chief engineer before opening or expanding the sand and gravel pit operation.

The following information shall be included on the form:

(a) The legal description of the sand and gravel pit operation;

(b) the date the project began or will begin;

(c) the number of acres of the groundwater table that will be exposed by the project at the time active mining ceases;

(d) a legal description and a map showing the location of the groundwater that will be exposed at the time active mining ceases;

(e) the year the pit excavation is estimated to be completed;

(f) measures that will be used to protect the area groundwater supply from pollution; and

(g) any other pertinent information that may be required by the chief engineer to understand the nature of the proposed project and to ensure that the provisions of K.S.A. 82a-734, and amendments thereto, and any regulations promulgated thereunder, are being complied with. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-721 and K.S.A. 82a-734; effective Sept. 22, 2000.)

5-13-2. Determination of "substantially adverse impact on the area groundwater supply." (a) A sand and gravel operation shall be deemed to cause a "substantially adverse impact on the area groundwater supply," as provided in K.S.A. 82a-734 (b) and amendments thereto, if the sand and gravel pit operation is opened or expanded after the effective date of this regulation in any township that has an average annual potential net evaporation greater than 18 inches per year as determined from K.A.R. 5-6-3.

(b) In any township that has an average annual potential net evaporation of 18 or fewer inches per year, as determined from K.A.R. 5-6-3, the opening or expansion of a sand and gravel pit operation, shall be deemed to not cause a "substantially adverse impact on the area groundwater supply," as provided in K.S.A. 82a-734 and amendments thereto, unless the chief engineer can demonstrate that the project will cause one or more of the following:

(1) A direct impairment to a groundwater approval of application or water right;

(2) an unreasonable deterioration of the groundwater quality;

(3) an unreasonable raising or lowering of the static water level; or

(4) prevention of any waters of the state from moving to a person having a prior right to use these waters. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-721 and K.S.A. 82a-734; effective Sept. 22, 2000.)

5-13-3. Determination of when groundwater evaporation is a beneficial use. On and after the effective date of this regulation, whenever the opening or expansion of a sand and gravel operation is considered to cause a substantially adverse impact on the area groundwater supply pursuant to K.A.R. 5-13-2, the evaporation caused shall be considered to be a beneficial use, and the operator shall be required to receive an approval of application, or approval of an application for change, pursuant to K.S.A. 82a-701 et seq. and amendments thereto, before exposing the groundwater table to evaporation. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 1999 Supp. 82a-711, K.S.A. 82a-721, and K.S.A. 82a-734; effective Sept. 22, 2000.)

5-13-4. Exemption. (a) To the extent that groundwater evaporation causes a substantially adverse impact to the area groundwater supply pursuant to K.A.R. 5-13-2, a new application to appropriate the groundwater evaporation caused by the project shall be exempt from meeting the safe yield, allowable appropriation, or similar types of regulations adopted by the chief engineer. This exemption shall be granted if the operator meets all of the criteria in subsection (b) because exempting the quantity of water that has been, or will be, evaporated by exposing the

groundwater table beneath the proven reserves will not prejudicially and unreasonably affect the public interest and will not impair any existing water right.

(b) Except as set forth in subsection (e), in order to qualify for this exemption, the operator shall show that on December 31, 1999, all of the following conditions were met:

(1) The operator had an active, existing sand and gravel mining operation.

(2) If required, the operator had a valid surface-mining license issued pursuant to the surface-mining land conservation and reclamation act, K.S.A. 49-601 et seq., and amendments thereto.

(3) If required, the operator had made a timely application for a hydraulic dredging permit or had received a hydraulic dredging permit issued pursuant to the Kansas water appropriation act.

(4) The operator had filed the water use reports required by, and paid any civil fines assessed by the chief engineer pursuant to K.S.A. 82a-732, and amendments thereto.

(5) The operator had paid the water protection fees required by K.S.A. 82a-954, and amendments thereto.

(6) To the extent necessary to physically operate, the operator had acquired all local permits and local zoning approvals.

(7) The operator had purchased, leased, or otherwise acquired legal control over proven sand and gravel reserves.

(8) The operator had filed an application to appropriate water or filed a notice of intent to open or expand a sand and gravel pit operation with the chief engineer when required by K.S.A. 82a-734(a), and amendments thereto.

(c) It shall be the burden of the operator to show that the operator meets the requirements of subsection (b) by filing the necessary information or documentation with the chief engineer on or before December 31, 2001. An extension of time may be granted by the chief engineer for good cause if the request for extension of time is filed by the operator with the chief engineer before December 31, 2001.

(d) To the extent that the operator meets the requirements of subsection (b) above, an application to appropriate water for evaporation of the groundwater caused by exposing the groundwater table shall be exempt from complying with safe yield, allowable appropriation, and similar types of regulations adopted by the chief engineer. This exemption shall apply to all the evaporation caused by exposing the groundwater table up to the areal extent of the proven reserves that existed on December 31, 1999.

(e) If, on the effective date of this regulation, an operator was in the process of establishing a replacement operation for an active, existing sand and gravel pit operation, an exemption shall be allowed by the chief engineer for the proposed replacement operation according to subsection (d) on terms, conditions and limitations that will neither cause impairment of existing water rights nor prejudicially and unreasonably affect the public interest if all of the following criteria are met:

(1) The proposed replacement sand and gravel operation is located outside the boundaries of all groundwater management districts and intensive groundwater use control areas.

(2) The geocenter of the proposed replacement operation is located within two miles of the geocenter of the existing, active operation.

(3) The proposed replacement operation met the provisions of paragraphs (b)(1) through (b)(6) of this regulation on December 31, 1999.

(4) The proposed replacement project meets the requirements of paragraphs (b) (7) and (8) on the effective date of this regulation. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-721, K.S.A. 1999 Supp. 82a-1904, and K.S.A. 82a-734; effective Sept. 22, 2000.)

5-13-5. Approval of pit operations that are opened or expanded after the effective date of this regulation. Except as set forth in K.A.R. 5-13-4, pit operations that are excavated or expanded after the effective date of this regulation and that have a substantial adverse impact on the area groundwater supply shall meet one of the following conditions:

(a) Receive prior approval of the chief engineer for a new permit to appropriate an annual quantity of water sufficient to offset the evaporation caused by exposing the groundwater table in a manner described in K.A.R. 5-13-7;

(b) acquire existing water rights and receive approval of the chief engineer to change the point of diversion, place of use, and the use made of water to authorize the water rights to be used for the project in a manner described in K.A.R. 5-13-7;

(c) acquire and take out of production sufficient water rights in the manner described in K.A.R. 5-13-7 to offset the net average annual evaporation caused by exposing the groundwater table; or

(d) any combination of the above. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-721 and K.S.A. 82a-734; effective Sept. 22, 2000.)

5-13-6. Determination of the maximum rate of diversion and annual quantity of water. The annual quantity of water, in acre-feet, required to be appropriated for evaporation caused by exposing the area groundwater table shall be determined by multiplying the exposed groundwater surface area of the project in acres by the potential net evaporation in inches, for Kansas, as found in K.A.R. 5-6-3, and dividing by 12. The rate of diversion shall be the natural rate of evaporation. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-721 and K.S.A. 82a-734; effective Sept. 22, 2000.)

5-13-7. Offsets for evaporation of groundwater. The net average annual quantity of groundwater evaporation shall be authorized, accounted for, or offset in one or more of the following ways:

(a) An approval of application or water right currently authorizes the use of water at that pit location.

(b) A new approval of application authorizes the use of water at that pit location.

(c) Acceptable quality surface water that is legally and physically available for groundwater recharge is authorized to be diverted into the proposed project.

(d) Both of the following conditions are met:

(1) Water is made available by acquiring all, or a portion of, an existing water right to any of the following:

(A) Use surface water or groundwater, or both, that is hydraulically connected to a stream channel aquifer in which the project is located;

(B) use groundwater from an unconsolidated regional aquifer that is within a two-mile radius of the geocenter of the project that is the same unconsolidated regional aquifer in which the project is located, or a hydraulically connected aquifer; or

(C) use groundwater from an unconsolidated regional aquifer that is within a 3.5 mile radius of the geocenter of the project and is the same unconsolidated regional aquifer in which the project is located, or a hydraulically connected aquifer, if the operator can demonstrate to the chief engineer that sufficient water rights to offset the evaporation caused by the project cannot be acquired within a two-mile radius of the geocenter of the project after making reasonable and prudent efforts to find both proven reserves and water rights.

(2) The applicant demonstrates to the chief engineer that the acquired water right, or portion of it, will no longer be exercised by any of the following:

(A) Placing it in the custodial care of the state;

(B) placing it in a perpetual trust approved by the chief engineer; or

(C) restricting its future use in some other way that the chief engineer determines to be adequate to ensure that it will no longer be exercised.

(e) Diffused surface water is diverted into the project from inside a berm surrounding the project built to prevent unacceptable quality surface water from entering the groundwater table. The average annual amount of runoff shall be determined from a map titled "figure 12. — mean annual runoff in Kansas," dated June 1982, published by the Kansas water office and hereby adopted by reference, unless the applicant demonstrates to the chief engineer, or the chief engineer has, better, more site-specific data.

(f) Any other water credit or offset that the chief engineer determines will adequately offset the groundwater evaporation caused by the pit operation. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-721 and K.S.A. 82a-734; effective Sept. 22, 2000.)

5-13-8. Offset calculations. All of the following requirements shall apply with respect to an offset water right described in K.A.R. 5-13-7(d): (a) No physical diversion of the offset water right shall be required or allowed.

(b) The project shall receive credit for 100 percent of the net consumptive use of the water right used as an offset.

(c) Credit for acquisition of an existing surface water right shall be given for an equivalent quantity of water that is legally and physically available within the terms, conditions, and limitations of the surface water right at the location of the groundwater pit. The quantity of water available at the groundwater pit from the acquired surface water right shall be calculated by taking into account the following:

(1) Stream gains;

(2) stream losses;

(3) transit losses;

(4) water supplied from intervening tributaries; and

(5) water needed to satisfy senior surface water rights to the same source of supply.

(d) Credit for acquisition of a groundwater right with a point of diversion located in the same stream channel aquifer as the groundwater pit shall be given for either of the following:

(1) A groundwater right located within a two-mile radius of the groundwater pit; or

(2) a groundwater right in the same source of water supply with a point of diversion located more than two miles up gradient of the geocenter of the groundwater pit for the quantity of water legally and physically available under that groundwater right at its original point of diversion, minus the transit loss between the original groundwater point of diversion and the geocenter of the proposed pit. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-721 and K.S.A. 82a-734; effective Sept. 22, 2000.)

5-13-9. Easements and covenants. The applicant shall provide any easements or covenants, attached to or running with the land, that are necessary to document that the offset water acquired pursuant to K.A.R. 5-13-7 will continue to be legally available to offset the evaporation of groundwater. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-721 and K.S.A. 82a-734; effective Sept. 22, 2000.)

5-13-10. Time to construct the diversion works for a sand and gravel pit operation.

(a) As used in this regulation, "completion of diversion works" means that both of the following have occurred:

(1) All equipment necessary to begin to operate a sand and gravel operation, including the hydraulic dredge, has been installed.

(2) Sufficient overburden has been excavated to begin to expose the groundwater to evaporation.

(b) A reasonable time to construct the diversion works for a sand and gravel pit operation shall be not less than one full year following the approval of the application to appropriate water.

(c) For good cause shown by the applicant, a reasonable extension of time to construct the diversion works shall be allowed by the chief engineer if both of the following conditions are met:

(1) The request for extension is filed pursuant to the requirements of K.A.R. 5-3-7.

(2) The request for extension is accompanied by the statutorily required filing fee. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-712 and 82a-713; effective Sept. 22, 2000.)

5-13-11. Time to perfect a water right for evaporation of groundwater. (a) A reasonable time to perfect a water right for evaporation of groundwater caused by a sand and gravel pit operation shall be neither less than five calendar years plus the remainder of the calendar year in which the application was approved, nor more than 20 years plus the remainder of the calendar year in which the application was approved.

(b)(1) For good cause shown by the applicant, a reasonable extension of the time to perfect the water right shall be allowed by the chief engineer if both of the following conditions are met:

(A) The request is timely filed pursuant to the terms of K.A.R. 5-3-7.

(B) The request is accompanied by the statutorily required filing fee.

(2) The total time to perfect a water right shall not exceed 40 years. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-713; effective Sept. 22, 2000.)

Article 14.—ENFORCEMENT AND APPEALS

5-14-1. Enforcement. (a) Except as set forth in subsection (i), the procedure set forth below shall be followed whenever enforcement action is taken by the chief engineer after becoming aware that a person may be performing any of the following:

(1) Violating any provision of K.S.A. 82a-701 et seq., and amendments thereto;

(2) violating any provision of a regulation adopted pursuant to that act; or

(3) violating a term, condition, or limitation of an approval of application or water right.

(b) The alleged violation shall be investigated by the chief engineer.

(c) A written report of the investigation shall be prepared by the chief engineer. This report shall include any documents regarding the matter that were relied upon or prepared by the chief engineer. This report shall be made a part of the official record of the chief engineer. If an approval of application or a water right is involved, the report shall be made an official part of that file.

(d)(1) If the investigation shows that no violation has occurred or that enforcement action is not warranted, no further enforcement action shall be taken at that time.

(2) If the investigation determines that a violation has occurred, an order shall be issued by the

chief engineer. The owner or owners of the approval of application or water right, as shown in the records of the chief engineer, shall be served by delivering a copy in person or sending a copy of the order by restricted mail. The order shall specify the following:

(A) What the violation is;

(B) what actions are necessary to correct the violation;

(C) what a reasonable time is in order to correct the violation. Extensions of time to correct a violation may be granted by the chief engineer if good cause is shown by the violator or owner;

(D) that the order will become effective immediately; and

(E) that a hearing may be requested within 15 days of the issuance of the order. The request for a hearing may include a request for a stay of the order. If the person shows good cause why a stay should be granted, a stay may be granted by the chief engineer.

(e) If the violation is corrected within the time specified by the chief engineer, the violator shall notify the chief engineer. An inspection shall be conducted by the chief engineer to determine if the violation has been corrected. If the violation has been corrected, the diversion of water may continue within the terms, conditions, and limitations of the approval of application or water right.

(f) If the violation is not corrected within the time specified by the chief engineer, an order requiring that unauthorized or illegal diversion of water cease until the violation is corrected shall be issued by the chief engineer.

(g) If the violator ceases diversion of water and then corrects the violation, the violator shall notify the chief engineer when the violation is corrected. The diversion works and the authorized place of use, as appropriate, shall be inspected by the chief engineer to determine if the violation has been corrected. If the chief engineer determines that the violation has been corrected, the order prohibiting diversion of water shall be rescinded by the chief engineer as soon as possible. When the owner or violator receives notice from the chief engineer that the order prohibiting the diversion of water has been rescinded, the diversion of water may recommence.

(h) (1) Any of the actions listed in paragraph (h)(2) may be taken by the chief engineer if the violator performs any of the following acts and fails to cease the diversion of water as ordered by the chief engineer:

(A) Violates any provision of K.S.A. 82a-701 et seq., and amendments thereto;

(B) violates any provision of a regulation adopted pursuant to that act; or

(C) violates a term, condition, or limitation of an approval of application or a water right.

(2) If the violator performs any act listed in paragraph (h)(1), any of the following actions may be taken by the chief engineer:

(A) Bring an action to enforce the orders of the chief engineer pursuant to the act for judicial review and civil enforcement of agency actions, K.S.A. 77-624 et seq., and amendments thereto;

(B) request the attorney general to bring an action in the name of the state of Kansas;

(C) request that criminal proceedings be brought pursuant to K.S.A. 82a-728, and amendments thereto;

(D) enter into a consent order with the violator specifying the remedial actions that shall be taken by the violator;

(E) take any other legally permissible enforcement action; or

(F) any combination of the above actions.

(i) The provisions of this regulation shall not apply to any actions taken by the chief engineer pursuant to K.S.A. 82a-706b, and amendments thereto, to enforce water right priorities and to prevent direct impairment by either of the following:

(1) Junior water rights; or

(2) illegal diversions of water.

(j) After the violator has been issued an order as specified in subsection (f), the violator may request an administrative hearing before the chief engineer in accordance with the provisions of K.A.R. 5-14-2. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706, 82a-706b, 82a-706d, and 82a-728; effective Sept. 22, 2000.)

5-14-2. Request for conference hearing. (a) Each written request for a hearing of an order issued by the chief engineer according to K.A.R. 5-14-1 shall be served on the chief engineer within 15 days of the issuance of the order. The request for a hearing may include a request for a stay of the order. If the requester demonstrates good cause for a stay to the chief engineer, a stay of the order may be granted by the chief engineer.

(b) If a request for a hearing is not served on the chief engineer within 15 days after the order

is issued by the chief engineer, the order shall become a final agency action as defined by K.S.A. 77-607, and amendments thereto.

(c) If a request for a hearing is filed with the chief engineer within 15 days of the issuance of an order, a conference adjudicative hearing shall be held by the chief engineer.

(d) A conference hearing shall be an informal proceeding conducted according to the following criteria:

(1) The hearing officer shall regulate the course of a conference proceeding.

(2) Only parties may testify and present written exhibits.

(3) Only parties may offer comments on the issues.

(4) The hearing officer may conduct all or part of the hearing by telephone, or other electronic means, if each participant in the hearing has the opportunity to participate in the entire proceeding while it is taking place.

(5) The hearing shall be recorded at the agency's expense.

(6) Any party, at the party's expense and subject to any reasonable conditions that the chief engineer may establish, may cause a person other than the chief engineer to prepare a transcript from the chief engineer's recording or cause additional recordings to be made during the hearing.

(e) After the conference adjudicative hearing, or completion of a full adjudicative hearing if the conference hearing was converted to a full hearing, a final agency action, as defined by K.S.A. 77-607, and amendments thereto, shall be issued by the chief engineer. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706 and K.S.A. 82a-706b; effective Sept. 22, 2000.)

5-14-3. Administrative appeal to the secretary of agriculture. (a) Except as set forth in subsection (f), a summary order shall be issued by the chief engineer in accordance with the provisions of K.S.A. 77-537 through 77-542, and amendments thereto, for the following types of actions:

(1) Approval or rejection of an application to change the place of use, the point of diversion, the use made of water, or any combination, filed pursuant to K.S.A. 82a-708b, and amendments thereto;

(2) approval of an application as filed, approval of a smaller maximum annual quantity of water than requested, approval with conditions necessary to protect the public interest, or disapproval of an application to appropriate water for beneficial use filed pursuant to K.S.A. 82a-711, and amendments thereto; and

(3) abandonment and termination of a water right pursuant to K.S.A. 82a-718, and amendments thereto.

(b) If a request for a hearing is not filed with the chief engineer within 15 days after issuance of the summary order by the chief engineer, the order shall become final.

(c) If a request for a hearing is filed with the chief engineer within 15 days, a conference adjudicative hearing shall be held by the chief engineer in accordance with the provisions of K.S.A. 77-533 through K.S.A. 77-535, and amendments thereto.

(d) After the conference adjudicative hearing, an initial order shall be issued by the chief engineer in accordance with the provisions of K.S.A. 77-526, and amendments thereto.

(e) A petition for review of the initial order shall be filed with the secretary of agriculture in accordance with the provisions of K.S.A. 77-527, and amendments thereto, within 15 days of the issuance of the initial order by the chief engineer.

(f) A hearing may be held by the chief engineer in accordance with K.A.R. 5-3-4a before processing a new application to appropriate water if the chief engineer determines that one of the following conditions exists:

(1) It is in the public interest.

(2) A person demonstrates to the chief engineer that approval of the application may cause impairment of senior approvals of applications or water rights.

If the chief engineer holds a hearing before processing a new application to appropriate water, an initial order shall be issued by the chief engineer. A petition for review of the initial order shall be filed in accordance with the provisions of subsection (e) of this regulation. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 1999 Supp. 82a-708b, K.S.A. 82a-709, K.S.A. 1999 Supp. 82a-711, K.S.A. 1999 Supp. 82a-718, K.S.A. 1999 Supp. 82a-1038, and K.S.A. 1999 Supp. 82a-1901; effective Sept. 22, 2000.)

5-14-4. Appeal of the failure of the chief engineer to timely issue a certificate of appropriation. (a) The time period specified in K.S.A. 82a-714(c), and amendments thereto, shall begin when the time authorized to perfect the wa-

ter right, including any authorized extensions of time, expires.

(b) If the chief engineer fails to issue a certificate of appropriation within the time limit specified by K.S.A. 82a-714(c) and amendments thereto, the water right owner may file a request for review with the secretary of agriculture pursuant to K.S.A. 82a-1901, and amendments thereto, within 15 days of the expiration of the time period specified in K.S.A. 82a-714(c) and amendments thereto. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 1999 Supp. 82a-714 and K.S.A. 1999 Supp. 82a-1901; effective Sept. 22, 2000.)

5-14-5. Conditions of a request for a conference hearing. (a) Any request for a conference hearing before the chief engineer shall meet the following conditions:

(1) Be in writing and be served on the chief engineer within 15 days of the issuance of the summary order;

(2) clearly admit, deny, or explain each of the findings of facts and conclusions of law in the summary order;

(3) identify any facts and conclusions of law that the person disputes and intends to place at issue; and

(4) state any other defenses and the bases for those defenses.

(b) If the person states that the person has no knowledge of a particular factual allegation, that allegation shall be deemed denied in the request. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706 and K.S.A. 82a-706b; effective Sept. 22, 2000.)

5-14-6. Informal settlement. At any time during the proceedings conducted under K.A.R. 5-14-2, K.A.R. 5-14-3, or K.A.R. 5-14-4, the alleged violator may request a settlement conference. The request shall be in writing and shall be served on the chief engineer on behalf of the alleged violator. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 1999 Supp. 82a-1901; effective Sept. 22, 2000.)

5-14-7. Conversion of a conference hearing. (a) At any point during a conference hearing being conducted according to K.A.R. 5-14-2, the conference hearing may be converted by the chief engineer to a full adjudicative hearing to be heard by the chief engineer.

(b) The conversion of a conference hearing to a full adjudicative hearing may be effected only upon providing notice to all parties to the original proceedings.

(c) The record of the conference hearing may be used in the full adjudicative hearing.

(d) After a conference hearing is converted to a full adjudicative hearing, the hearing officer shall perform the following:

(1) Give any additional notice to parties or other persons necessary to satisfy the requirements of a full adjudicative hearing; and

(2) conduct any additional proceedings necessary to satisfy the requirements of a full adjudicative hearing.

(e) If the conference hearing is converted to a full adjudicative hearing, the full adjudicative hearing shall be conducted according to the following criteria:

(1) The hearing officer shall regulate the course of the proceedings.

(2) The parties may testify and present exhibits.

(3) The hearing officer may allow nonparties an opportunity to present oral or written statements and exhibits.

(4) All testimony shall be given under oath.

(5) To the extent necessary for full disclosure of all relevant facts and issues, the hearing officer shall afford to all parties the opportunity to respond, present evidence and arguments, conduct cross-examination, and submit rebuttal evidence.

(6) The hearing officer may conduct all or part of the hearing by telephone or other electronic means, if each party in the hearing has an opportunity to participate in the entire proceeding while it is taking place.

(7) The hearing shall be recorded at the agency's expense.

(8) Any party, at that party's expense and subject to any reasonable conditions that the state agency may establish, may cause a person other than the state agency to prepare a transcript from the state agency's recording or cause additional recordings to be made during the hearing. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706 and 82a-706b; effective Sept. 22, 2000.)

5-14-10. Civil penalties; suspension or modification of water rights. (a) In addition to any other authorized enforcement procedures, if the chief engineer finds that any of the violations specified in K.S.A. 82a-737, and amendments thereto, have occurred, a written order shall be issued by the chief engineer stating the following:

(1) The nature of the violation;

(2) the factual basis for the violation;

(3) the civil penalty, suspension, modification of a water right or use of water, or any combination of these, to be imposed; and

(4) the appropriate procedure for appeal pursuant to K.S.A. 82a-1901, and amendments thereto.

(b) The categories of offenses specified in subsections (c), (d), and (e) shall be applied when assessing the civil penalty for each violation. Each day on which the violation continues to occur may constitute a separate offense.

(c)(1) Each category 1 offense shall result in a civil penalty of $100.

(2) Category 1 offenses shall include the following:

(A) A threat to divert water without authorization from the chief engineer;

(B) irrigating an unauthorized place of use that is 10 acres or less;

(C) diversion of water at a rate in excess of the authorized rate of diversion, but less than 115 percent of the authorized rate of diversion;

(D) maintaining a water flowmeter or other water-measuring device required by the chief engineer that is out of compliance as specified by K.A.R. 5-1-9; and

(E) violation of any other condition on a water right or approval of application not specified anywhere else in this regulation.

(d)(1) Each category 2 offense shall result in a civil penalty of $500.

(2) Category 2 offenses shall include the following:

(A) Diverting water from an unauthorized point of diversion of water;

(B) irrigating an unauthorized place of use that is more than 10 acres;

(C) failure to properly implement a conservation plan required by the chief engineer;

(D) committing a waste of water;

(E) diversion of water at a rate that equals or exceeds 115 percent of the authorized rate of diversion;

(F) failure to install a water flowmeter or other acceptable water-measuring device;

(G) failure to promptly provide complete and accurate water use or other data, information, or records requested by the chief engineer, except the annual water use reports required by K.S.A. 82a-732, and amendments thereto;

(H) diversion of water in excess of the authorized quantity of water; and

(I) applying water to an unauthorized type of beneficial use.

(e)(1) Each category 3 offense shall result in a civil penalty of $1,000.

(2) Category 3 offenses shall include the following:

(A) Tampering with a water flowmeter or other acceptable water-measuring device;

(B) causing a water flowmeter or other acceptable water-measuring device to show an incorrect reading by any method, including any of the following:

(i) Altering the propeller;

(ii) reversing the water flowmeter; or

(iii) running the water flowmeter in reverse by any means;

(C) failing to timely install or removing a required water flowmeter or other acceptable water-measuring device;

(D) falsifying water use or other data required by the chief engineer;

(E) denying authorized personnel of the chief engineer access as required by K.S.A. 82a-706b, and amendments thereto;

(F) violating a cease and desist order issued by the chief engineer; and

(G) violating an order of the chief engineer issued pursuant to K.S.A. 82a-706b and amendments thereto.

(f) The civil penalties specified in paragraph (c)(1) may be increased if the chief engineer finds that aggravating circumstances exist. The civil penalties specified in paragraph (d)(1) may be increased or decreased if the chief engineer finds that aggravating or extenuating circumstances exist. The civil penalties specified in paragraph (e)(1) may be decreased if the chief engineer finds that extenuating circumstances exist. Extenuating circumstances and aggravating circumstances shall include the following:

(1) Prior violations;

(2) intentional noncompliance or gross negligence; and

(3) failure to correct the violation upon discovery or notification by the chief engineer.

(g) In addition to the assessment of a civil penalty or any other penalty provided for by law, any water right may be modified or suspended by the chief engineer upon the issuance of a written order finding a violation as established in subsection (a). Except as otherwise specified by regulation,

violation of either a multiyear annual allocation or a condition limiting the net acres that may be irrigated in any one calendar year pursuant to an approval to allow annual rotation of the authorized place of use for irrigation shall result in the following:

(1) A two-year suspension of all water use authorized by the water right, any term permit, and any water right upon which the multiyear allocation or rotation was based;

(2) a subsequent restriction of the authorized place of use to the base acreage at a location specifically set forth in the change approval; and

(3) after any suspension has expired, a reversion to all conditions in effect on the water right before approval of the change application authorizing the multiyear allocation or rotation.

In all other cases, the term of the suspension or modification shall be determined by the chief engineer based upon the circumstances set forth in subsection (f).

(h) Any person aggrieved by an order of the chief engineer may request a review pursuant to K.S.A. 82a-1901, and amendments thereto, and after exhaustion of administrative remedies, may appeal to the district court in the manner provided by the act for judicial review and civil enforcement of agency actions. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706a, K.S.A. 2002 Supp. 82a-737, and K.S.A. 2002 Supp. 82a-1901; effective Oct. 24, 2003.)

5-14-11. Civil fines; water use reporting. (a) Each owner of a water right or approval of application who fails to perform either of the following shall be assessed a civil penalty of $250 for each water right or approval of application that is not timely filed or that is materially incomplete or inaccurate:

(1) Timely submit an annual water use report pursuant to K.S.A. 82a-732, and amendments thereto; or

(2) submit a complete and accurate water use report as required by K.S.A. 82a-732, and amendments thereto.

(b) If the owner submits both the complete and accurate water use report and payment of the civil penalty after March 1 but before June 1, the civil penalty per water right or approval of application shall be reduced to $50 for each water right or approval of application. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706a and K.S.A. 82a-732; effective Oct. 24, 2003.)

Article 15.—MINIMUM DESIRABLE STREAMFLOWS

5-15-1. Administration of minimum desirable streamflow. (a) Except as specified in subsection (d), if the streamflow at a minimum desirable streamflow (MDS) gaging station falls below the streamflow established in K.S.A. 82a-703c, and amendments thereto, for a period of seven consecutive days, a determination of whether the following conditions have been met shall be made by the chief engineer:

(1) The actual daily average streamflow at the gage has been less than the streamflow trigger value set by K.A.R. 5-15-4.

(2) If an alluvial aquifer has a significant effect on streamflow, the static groundwater level in the alluvial aquifer above the gage is insufficient to maintain MDS in the stream.

(b) Whenever the chief engineer determines that MDS administration should occur according to subsection (d) or because the conditions specified in paragraphs (a)(1) and (2) have both been met, water rights and approvals of applications with a priority after April 12, 1984 shall be administered in order of priority as necessary to protect the appropriate minimum desirable streamflow specified in K.S.A. 82a-703c, and amendments thereto. Owners of record in the office of the chief engineer of water rights and approvals of applications that are being administered shall be notified by the chief engineer that water rights and approvals of applications are being administered to protect MDS. This notification shall be made by certified mail, personal notice, or other verifiable means.

(c) After administration to protect MDS has begun, no person that has received notice according to subsection (b) may divert water under the authority of a water right or approval of application with a priority after April 12, 1984, unless one of the following conditions is met:

(1) The owner of the water right or approval of application has entered into an annual MDS consent order with the chief engineer in accordance with the provisions of K.A.R. 5-15-2 and is diverting water in accordance with the terms of that MDS consent order.

(2) The chief engineer has determined, in accordance with the provisions of K.A.R. 5-15-3, that administration of water rights and approvals of applications with a priority after April 12, 1984 is no longer necessary to protect MDS and has notified the owners by certified mail, personal notice, or other verifiable means that diversions may continue in accordance with the terms, conditions, and limitations of the water right or approval of application.

(d) If the streamflow at an MDS gaging station falls below the level established in K.S.A. 82a-703c, and amendments thereto, for a period of seven consecutive days and no streamflow trigger value has been set for an MDS gaging station in K.A.R. 5-15-4, a determination of whether and when MDS administration will begin and how it should occur shall be made by the chief engineer, based on the following factors:

(1) The general hydrologic conditions affecting streamflow in the stream reach;

(2) the magnitude and duration of recent streamflows;

(3) the extent to which groundwater contributes to streamflow;

(4) the effects of drought on streamflow;

(5) the existence and effect of relevant water management agreements;

(6) the magnitude of the effect that the administration of water rights with priorities junior to the MDS values would have on the streamflow; and

(7) the effect of reservoir operations.

This regulation shall be effective on and after August 27, 2002. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-703a, 82a-703b, and 82a-703c; effective, T-5-4-29-02, April 29, 2002; effective Aug. 27, 2002.)

5-15-2. Minimum desirable streamflow consent orders. (a) An annual minimum desirable streamflow (MDS) consent order according to K.A.R. 5-15-1(c)(1) may be entered into by the chief engineer and the owner of the water right or approval of application to divert surface water. This consent order shall contain the following provisions:

(1) Whenever the chief engineer has determined that the administration of water rights and approvals of applications to divert surface water with a priority after April 12, 1984 is necessary to protect the minimum desirable streamflow set by K.S.A. 82a-703c, and amendments thereto, water shall not be diverted under the authority of these water rights or approval of applications unless the owner has been notified by the chief engineer by certified mail, personal notice, or other verifiable means that either of the following conditions has been met:

(A)(i) The chief engineer has determined that the average daily streamflow has been, or is likely to be, at or above the temporary surface water diversion threshold for a period of time specified in K.A.R. 5-15-4 or set by the chief engineer according to K.A.R. 5-15-1(d); and

(ii) the chief engineer has determined that water is available to be diverted during that time period under the priority of water rights or approval of applications with a priority after April 12, 1984 without impairing senior water rights or senior water reservation rights.

(B) The chief engineer has determined that it is no longer necessary to administer water rights and approval of applications to protect the minimum desirable streamflow set by K.S.A. 82a-703c, and amendments thereto.

(2) The owner of the water right or approval of application shall properly install and maintain a water flowmeter on all points of diversion authorized by the water rights or approval of applications in accordance with regulations adopted by the chief engineer.

(3) The water right owner agrees that failure to abide by either of the following will result in the suspension of the water right or approval of application pursuant to K.S.A. 82a-737, and amendments thereto, for the remainder of the calendar year, and any other enforcement actions that may be authorized by law:

(A) The terms of the MDS consent order; or

(B) the terms, conditions, and limitations of the water right or approval of application.

(4) The water right owner agrees to comply with any other provisions that the chief engineer determines are necessary to prevent impairment, protect MDS values, and protect the public interest.

(b) If the chief engineer determines that hydrologic conditions indicate that some groundwater will be available to be pumped in the basin during the next water-use season or year by water rights or approval of applications with a priority after April 12, 1984, the owner of the water right or approval of application may enter into an an-

nual MDS consent order pursuant to K.A.R. 5-15-1(c)(1) to divert groundwater, upon approval of the chief engineer. This consent order shall contain the following provisions:

(1) Whenever the chief engineer has determined that the administration of water rights and approval of applications to divert groundwater with a priority after April 12, 1984 is necessary to protect minimum desirable streamflows set by K.S.A. 82a-703c, and amendments thereto, groundwater shall not be diverted under the authority of the water right or approval of application unless the owner has been notified by the chief engineer by certified mail, personal notice, or other verifiable means that one of the following conditions has been met:

(A) During MDS administration during that calendar year, the owner is authorized to divert, pursuant to the owner's water right or approval of application, a quantity of water not to exceed that quantity of water set forth in K.A.R. 5-15-4 as the well pumping allowance.

(B) The chief engineer has determined that it is no longer necessary to administer water rights and approvals of applications to protect the minimum desirable streamflows set by K.S.A. 82a-703c, and amendments thereto.

(2) The owner of the water right or approval of application shall properly install and maintain a water flowmeter on all points of diversion authorized by the water right or approval of application in accordance with regulations adopted by the chief engineer.

(3) The total quantity of water authorized to be diverted under the water right or approval of application during a calendar year shall not exceed the annual quantity of water authorized.

(4) The water right owner agrees that failure to abide by either of the following will result in the suspension of the water right or approval of application for the remainder of the calendar year, and any other enforcement actions that may be authorized by law:

(A) The terms of the MDS consent order; or

(B) the terms, conditions, and limitations of the water right or approval of application.

(5) The water right owner agrees to comply with any other provisions that the chief engineer determines are necessary to prevent impairment, protect MDS values, and protect the public interest.

This regulation shall be effective on and after August 27, 2002. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-703a, 82a-703b, and 82a-703c, and K.S.A. 2001 Supp. 82a-737; effective, T-5-4-29-02, April 29, 2002; effective Aug. 27, 2002.)

5-15-3. Cessation of minimum desirable streamflow administration. (a) Except as specified in subsection (c), whenever the chief engineer determines that both of the conditions specified in subsection (b) have been met, the administration of water rights and approvals of applications with a priority after April 12, 1984 to protect minimum desirable streamflows pursuant to K.S.A. 82a-703c, and amendments thereto, shall be declared by the chief engineer to be no longer necessary. The owners of those water rights and approvals of applications shall be notified by the chief engineer by certified mail, personal notice, or other verifiable means that the owners may recommence diverting water in accordance with the terms, conditions, and limitations of their water rights or approvals of applications.

(b)(1) The streamflows at the minimum desirable streamflow (MDS) gage have exceeded the streamflows established by K.S.A. 82a-703c, and amendments thereto, for a period of 14 consecutive days.

(2) If a significant alluvial aquifer exists, the average static water level in the alluvial aquifer has recovered sufficiently to maintain MDS in the stream.

(c) Whenever the chief engineer determines that hydrologic conditions indicate that MDS values have been met or exceeded and are likely to be maintained for the foreseeable future, MDS administration may be declared by the chief engineer to be no longer necessary even if both of the conditions of subsection (b) have not been met.

This regulation shall be effective on and after August 27, 2002. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-703a, 82a-703b, and 82a-703c; effective, T-5-4-29-02, April 29, 2002; effective Aug. 27, 2002.)

5-15-4. Standards for minimum desirable streamflow. The streamflow trigger values, temporary surface water diversion thresholds, and well pumping allowances set forth in the following table shall be used whenever appropriate in these regulations.

MDS gaging station	streamflow trigger value	temporary surface water diversion threshold	well pumping allowance
Republican River Concordia	150 percent of the daily average MDS value* for the 60 preceding days	115 percent of MDS value* for a period of at least five days	32 percent of the maximum annual quantity of water that has not been diverted under the authority of that water right or approval of application, at the time MDS administration begins
Republican River Clay Center	150 percent of the daily average MDS value* for the 60 preceding days	100 percent of MDS value* for a period of at least five days	32 percent of the maximum annual quantity of water that has not been diverted under the authority of that water right or approval of application, at the time MDS administration begins

* "MDS value" means the minimum desirable streamflow value established by K.S.A. 82a-703c, and amendments thereto.

This regulation shall be effective on and after August 27, 2002. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-703a, 82a-703b, and 82a-703c; effective, T-5-4-29-02, April 29, 2002; effective Aug. 27, 2002.)

Article 16.—FLEX ACCOUNT

5-16-1. Definitions. As used in this article of regulations, in the Kansas water appropriation act, and by the chief engineer in the administration of the Kansas water appropriation act, unless the context clearly requires otherwise, the following words and phrases shall have the meanings ascribed to them in this regulation. (a) "Base amount" and "BA" mean the quantity of water deposited in a flex account.

(b) "Base average usage factor" and "BAUF" mean the percentage of the "base average usage," as this term is defined in K.S.A. 82a-736 and amendments thereto, that is multiplied by five as a part of the calculations set out by K.A.R. 5-16-5 to determine the quantity of water that may be deposited into a flex account. The BAUF shall not exceed the maximum of 90% established by K.S.A. 82a-736 and amendments thereto.

(c) "Base water right" means a vested or certified water right or rights for which the owner applies to the chief engineer to establish a flex account pursuant to K.S.A. 82a-736, and amendments thereto.

(d) "BAU" means the "base average usage" as defined in K.S.A. 82a-736, and amendments thereto.

(e) "Good standing," only as that term is used in K.S.A. 82a-736, and amendments thereto, in reference to base water rights, means a base water right that meets the following conditions:

(1) Has been lawfully exercised within the 11-year time period specified in K.A.R. 5-16-5;

(2) has had all required water use reports filed and any civil fines assessed for failure to timely file a complete and accurate water use report paid; and

(3) has had no period of nonuse with a duration of five or more consecutive years since January 1, 1990, except for enrollment in the water right conservation program according to K.A.R. 5-7-4, enrollment in the federal conservation reserve program, or enrollment in another multiyear federal or state conservation program.

(f) "Significant water conservation measures" means actual physical changes in a water distribution system or management practices that improve water use efficiency, including the following:

(1) Conversion from flood irrigation to center pivot irrigation with a nozzle package designed to improve water use efficiency;

(2) irrigation scheduling;

(3) conversion to subsurface drip irrigation; and

(4) removal of an end gun, resulting in a significant reduction in the number of irrigated acres. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706a and K.S.A. 2004 Supp. 82a-736, as amended by L. 2005, ch. 142, sec. 3; effective Oct. 11, 2002; amended Jan. 6, 2006.)

5-16-2. Fee to establish flex account and apply for term permit. The filing fee for establishing a flex account and applying for a five-year term permit to exercise the flex account shall be $400. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 2001 Supp. 82a-708a(d), as amended by L. 2002, Ch. 181, § 21; effective Oct. 11, 2002.)

5-16-3. Establishing a flex account. (a) A flex account shall be established by filing an application for a flex account and a term permit on a form prescribed by the chief engineer. The five-year period shall begin on January 1 of the next calendar year for which the application has been timely filed, unless expressly authorized by the chief engineer to begin the following January 1. The application shall also show the location of all wells located within one-half mile of the proposed point of diversion, and the names, addresses, and telephone numbers of the owners of those wells. Except as set forth in subsection (e), a separate application shall be filed for each water right and each point of diversion for which the owner desires to establish a flex account. Each application shall be accompanied by the filing fee specified in K.A.R. 5-16-2.

(b) Before any application to establish a flex account and a term permit will be accepted for filing, the application shall be signed by at least one owner of the water right, or a duly authorized agent of an owner of the water right.

(c) Before the flex account can be established or the term permit approved, all of the water rights owners, or a duly authorized agent of the owners, shall verify upon oath or affirmation that the statements contained in the application are true and complete.

(d) If one or more owners refuse to sign the application or if a written request is filed by one or more of the owners to withdraw their signatures from the application before the application is approved, the application shall be dismissed.

(e) A single application to establish a flex account and apply for a term permit may be filed in the following situations:

(1) Multiple water rights authorize the diversion of water from a single point of diversion that diverts water to an identical place of use for a single type of use.

(2) Multiple points of diversion are authorized by the chief engineer to divert water through a single water flowmeter before going to an identical place of use.

(f) The flex account shall not be established, and the term permit to exercise the flex account shall not be valid until both have been approved by the chief engineer. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706a and K.S.A. 2001 Supp. 82a-736; effective Oct. 11, 2002.)

5-16-4. Conditions on the term permit. (a) The place of use authorized by a term permit shall be identical to the place or places of use authorized by the base water right or rights.

(b) The type of use authorized by a term permit shall be limited to one of the types of use authorized by the base water right or rights.

(c) The rate of diversion authorized by a term permit shall not exceed the maximum instantaneous rate of diversion authorized by the base water right or rights. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706a and K.S.A. 2001 Supp. 82a-736; effective Oct. 11, 2002.)

5-16-5. Maximum annual quantity of water authorized by term permit. (a) Except as set forth in subsections (b) through (e), the maximum quantity of water deposited in a flex account and authorized to be diverted in five consecutive calendar years under the authority of a term permit shall be determined in accordance with K.S.A. 82a-736, and amendments thereto, by means of these calculations:

(1) Adding the total actual, legal annual water use of the base water right or rights for the period of calendar years 1992 through 2002;

(2) dividing that total quantity of water by 11;

(3) multiplying that quantity by the BAUF; and

(4) multiplying that quantity by five.

(b) If significant water conservation measures were implemented under the base water rights at any time during the period of calendar years 1992 through 2002, the average annual quantity of water actually used may be calculated using the five consecutive calendar years immediately preceding the implementation of significant water conservation measures, but these five calendar years shall not begin before calendar year 1987. The five-year allocation under the term permit shall be determined by means of these calculations:

(1) Adding the total actual, legal annual water use of the base water right or rights for the five consecutive calendar years;

(2) dividing that total quantity of water by five;

(3) multiplying that quantity by the BAUF; and

(4) multiplying that quantity by five.

(c) If water use records for a base water right are inadequate to accurately determine actual water use during any calendar year during the period used to determine the base average usage, then that year shall be counted as having no water use.

(d) No flex account shall be allowed if the flex account is inconsistent with the provisions of any intensive groundwater use control area created

pursuant to K.S.A. 82a-1036 through K.S.A. 82a-1040, and amendments thereto.

(e) If water was authorized to be diverted for less than the entire period used to determine the base average usage, the five-year allocation shall be determined by means of these calculations:

(1) Adding the total actual, legal annual water use of the base water right or rights for the entire period used to determine the base average usage;

(2) dividing the total quantity by the number of years, or parts thereof, that water was authorized to be diverted by the chief engineer;

(3) multiplying that quantity by the BAUF; and

(4) multiplying that quantity by five.

Water rights that authorized use of water for less than two calendar years during the period used to determine the base average usage shall not be eligible for a flex account. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706a and K.S.A. 2004 Supp. 82a-736, as amended by L. 2005, ch. 142, sec. 3; effective Oct. 11, 2002; amended Jan. 6, 2006.)

5-16-6. Flex accounts and term permits. (a) The duration of the flex account and term permit shall be five consecutive calendar years.

(b) There shall be no extension of a flex account or a term permit beyond the period of five consecutive calendar years originally authorized.

(c) There shall be no carryover of unused quantities of water from one flex account or term permit to another flex account or term permit.

(d) Only one flex account shall be in force for a point of diversion or a water right at any time.

(e) A water flowmeter meeting the requirements of the chief engineer shall be installed on each point of diversion authorized by the term permit. If an existing water flowmeter had been required on or after September 22, 2000 or if there is no existing water flowmeter, the water flowmeter shall meet the requirements of the chief engineer in effect at the time the term permit is approved. If a water flowmeter was installed before September 22, 2000, the water flowmeter shall meet the requirements of K.A.R. 5-1-6(b).

(f) Only an entire water right, or a portion of a water right that has been formally divided, may be deposited in a flex account.

(g) All water diverted pursuant to a term permit and the base water rights associated with the term permit shall be counted against the quantity of water deposited in the flex account. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706a and K.S.A. 2001 Supp. 82a- 736; effective Oct. 11, 2002.)

5-16-7. Conditions under which a base water right may be exercised. Each term permit approved by the chief engineer according to this article shall include the condition that if the term permit can no longer be exercised because of an order issued by the chief engineer, including an intensive groundwater use control area order, a minimum desirable streamflow order, or an order to administer water rights to prevent impairment, then any base water right may be exercised to the extent that all of the following conditions are met:

(a) The base water right is in priority.

(b) The annual quantity of water authorized by the base water right has not been diverted during that calendar year.

(c) The five-year allocation authorized by the term permit has not been used.

(d) The use of water under the base water right does not impair water rights senior to the base water right. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706a and K.S.A. 2001 Supp. 82a-736; effective Oct. 11, 2002.)

Article 17.—WATER BANKING

5-17-1. Definitions for water banking. As used in these water banking regulations, in the Kansas water banking act, K.S.A. 82a-761 et seq. and amendments thereto, and by the chief engineer in the administration of this act, unless the context clearly requires otherwise, the following words and phrases shall have the meanings ascribed to them in this regulation:

(a) "Bankable water right" means a water right, or portion of a water right, that meets the requirements of the following:

(1) K.S.A. 82a-764, and amendments thereto; and

(2) the water bank charter.

In calculating the portion of a water right that is bankable, credit shall be given for any water conservation practices implemented according to this regulation. The bankable portion of linked water rights shall be determined on a case-by-case basis. For a surface water right that has water available from a water assurance district, the quantity of water available from the water assurance district may be considered when determining how much of the water right is bankable.

(b) "Good standing," only for the purposes of

the Kansas water banking act and regulations, means a water right, or portion of a water right, that meets all of the following criteria:

(1) Except as set forth in paragraph (b)(2), the water right, or portion of a water right, has been lawfully put to beneficial use within the past five years.

(2) For a water right that has been enrolled in the water right conservation program (WRCP) or a water right whose authorized place of use has been enrolled in the conservation reserve program (CRP), the water right has been put to lawful beneficial use within the five-calendar-year period before enrollment in the program. A water right that is currently enrolled in the WRCP shall not be deposited in a water bank. If the authorized place of use is currently enrolled in the CRP, the water right shall not be deposited in a water bank, unless the authorized place of use has been changed to a place of use that is not enrolled in the CRP and water has actually been applied to beneficial use on the newly authorized place of use for at least one calendar year.

(3) All of the following conditions regarding the water right are met:

(A) In the five calendar years before the water right is deposited or placed in a safe deposit account, there has not been a conviction associated with that water right pursuant to K.S.A. 82a-728, and amendments thereto.

(B) No civil penalty has been assessed pursuant to K.S.A. 82a-737, and amendments thereto, against anyone for violations relating to the water right.

(C) The water right has not been suspended pursuant to K.S.A. 82a-737, and amendments thereto.

(D) No order of the chief engineer relating to the water right has been disobeyed.

(E) The applicant who is applying to deposit the water right into, or lease water from, a water bank or to withdraw water from a safe deposit account has a history of compliance with contracts with the water bank and term permits used to withdraw water from a water bank or from a safe deposit account.

(c) "Long-term rolling average," only for the purposes of the Kansas water banking act, means a five-year running average of the net consumptive use of all the participating rights. This average shall be calculated by adding together the average net consumptive use for each participating right in a hydrologic unit.

The average shall first be computed after the water bank has been in operation for three years. For each year after the third year, another year's data shall be added until five years of data are available. After the water bank has been in operation for five years or more, the last five years of data shall be used to calculate the average. The resulting number shall then be compared against the average annual net consumptive use of participating rights in that hydrologic unit for the representative past period.

(d) "Net consumptive use" means the gross diversion of water for beneficial use, minus the following:

(1) Waste of water, as defined in K.A.R. 5-1-1; and

(2) return flows to the source of water supply through surface water that is not waste and by deep percolation.

For irrigation use, only as used in the water banking act and regulations, net consumptive use shall be calculated as 85 percent of the actual legal gross diversions in any one calendar year or calculated using some other methodology approved by the chief engineer as complying with standard engineering practices. Net consumptive use for all other types of water use shall be calculated in accordance with a methodology approved by the chief engineer as complying with standard engineering practices.

The average annual net consumptive use for the representative past period shall be calculated by first calculating the average annual net consumptive use for each participating right for the representative past period and then adding those averages together. If a participating right did not legally divert water during any year in the representative past period or was not authorized to divert water, that year shall be counted as zero in computing the average annual consumptive use for that water right for the representative past period.

(e) "Participating rights" means all of the water rights in a hydrologic unit that are under contract to be deposited in a water bank or safe deposit account.

(f) "Representative past period" means a period of at least 10 consecutive years occurring entirely before the date on which the water bank is chartered and having a reasonable balance of years with above-normal and below-normal precipitation. For a water right not permitted during the entire representative past period, for the sole pur-

pose of determining the portion of that water right that is bankable pursuant to K.S.A. 82a-765(b)(9) and amendments thereto, the water bank may select a different representative past period, but the bankable portion of each water right shall be the lesser of either of the following:

(1) The annual quantity of water perfected; or

(2) the average percentage of water rights determined to be bankable, for all water rights in that hydrologic unit that were permitted for the representative past period occurring entirely before the date on which the bank was chartered.

(g) "Severely depleted groundwater aquifer" means an aquifer that meets any of the following criteria:

(1) The chief engineer has declared the aquifer to be an aquifer in need of recovery pursuant to K.S.A. 2-1919, and amendments thereto.

(2) The average static water level decline in the hydrologic unit, based on a representative sample of wells distributed throughout the hydrologic unit, in the 20 calendar years immediately preceding the calendar year in which the water bank was chartered is substantially greater than the average annual variability in the static water level in the hydrologic unit.

(3) The average yield of the groundwater aquifer is not sufficient to meet the 50 percent chance net irrigation requirements (N.I.R.) for crops typically grown in the hydrologic unit using methods of irrigation typically used in that hydrologic unit.

(h) "Severely depleted stream course" means a stream reach that has been declared by the chief engineer to be a stream reach in need of stream recovery pursuant to K.S.A. 2-1919, and amendments thereto.

(i) "Water conservation practices" means actual physical changes in a water distribution system or management practices that were made to improve water use efficiency during the representative past period, including the following:

(1) Conversion from flood irrigation to center pivot irrigation with a nozzle package designed to improve water use efficiency;

(2) irrigation scheduling;

(3) conversion to subsurface drip irrigation; and

(4) removal of an end gun, resulting in a reduction in the number of irrigated acres.

The applicant shall have the burden of documenting the implementation of water conservation practices that could have altered the results of the calculation of the portion of the water right that is bankable, to the detriment of the applicant. (Authorized by and implementing K.S.A. 2003 Supp. 82a-769; effective Aug. 13, 2004.)

5-17-2. Application to deposit a water right into a water bank or withdraw a deposit. (a) Each water right owner proposing to deposit all or a portion of a water right into a water bank shall complete an application on a form prescribed by the water bank and approved by the chief engineer. The application shall be filed with the water bank on or before December 31 of the year preceding the first calendar year in which the deposit will be made. A water right, or a portion of a water right, may be deposited only in increments of full calendar years. The application shall contain the following information concerning the water right, or portion of the water right, that is proposed to be deposited:

(1) The file number of the water right to be deposited;

(2) if the water right is a vested right or an appropriation right that has been certified by the chief engineer, specification of that status;

(3) the hydrologic unit from which the water right is authorized to withdraw water;

(4) the calendar years during which the water right will be on deposit. This period shall not exceed five years; and

(5) any CRP contracts that were in effect for any part of the representative past period.

(b) A water right may be withdrawn from deposit only if both of the following conditions are met:

(1) The water right has not been leased in whole or part.

(2) An application to withdraw the water right from deposit is made before July 1 of the calendar year for which the deposit has been made. Withdrawal of a water right during one calendar year also shall withdraw the water right from deposit in any subsequent years for which the water right may have been deposited. (Authorized by K.S.A. 2003 Supp. 82a-769; implementing K.S.A. 2003 Supp. 82a-763, K.S.A. 2003 Supp. 82a-764, and K.S.A. 2003 Supp. 82a-769; effective Aug. 13, 2004.)

5-17-3. Contract for deposit of a water right. (a) Each water right owner that has an application approved for the deposit of all or a portion of a water right into a water bank and that desires to deposit all or a portion of the water right into the water bank shall enter into a contract with

the water bank that includes the following provisions and information:

(1) The file number of the water right to be deposited;

(2) the hydrologic unit from which the water is authorized to be withdrawn;

(3) the calendar years during which the water right will be on deposit, which shall not exceed five years;

(4) the quantity of water to be deposited;

(5) the terms of payment for the deposit;

(6) if a portion of a water right is deposited, an agreement that the quantity of water pumped under the portion of the water right that is not deposited shall not exceed the difference between the bankable portion of the water right and the amount deposited; and

(7) an acknowledgment of the specific fines or suspension penalties that will be imposed for violation of the contract.

(b) The water bank shall notify the chief engineer of each water right deposit before the deposit is leased. This notice shall include a determination of the annual quantity of water that is bankable for each water right and the portion of the bankable quantity of the water right that has been deposited. If an entire water right is deposited, no water may be pumped under that water right, except under the authority of a lease from a water bank and a term permit issued by the chief engineer to exercise that lease. If a portion of a water right is deposited, the annual quantity of water pumped under the portion of the water right that is not deposited shall not exceed the difference between the bankable portion of the water right and the amount deposited. An order may be issued by the chief engineer after the deposit notifying the owner of the annual quantity of water, if any, that may be diverted under the original water right to prevent the net consumptive use of the water right from being increased. (Authorized by K.S.A. 2003 Supp. 82a-769; implementing K.S.A. 2003 Supp. 82a-763 and K.S.A. 2003 Supp. 82a-769; effective Aug. 13, 2004.)

5-17-4. Application to lease water. (a) Each person proposing to lease water from a water bank shall complete an application for a contract to lease water on a form prescribed by the water bank and approved by the chief engineer and an application for a term permit. The application for the contract shall be filed with the water bank. The application for a term permit shall be filed with the chief engineer. Each application shall include the following information concerning the water proposed to be leased:

(1) The quantity of water to be leased;

(2) the proposed maximum rate of diversion;

(3) the calendar years during which water is proposed to be leased, which shall not exceed the length of the water bank charter plus three calendar years;

(4) the location of the proposed point of diversion, including the hydrologic unit;

(5) the proposed place of use;

(6) the proposed use made of water;

(7) the water flowmeter reading from the proposed point of diversion, if the water will be diverted from an existing point of diversion, at the time the application is filed;

(8) the file numbers of the other water rights and approvals of applications that authorize use of water from the proposed point of diversion; and

(9) if the proposed use is for irrigation, the number of acres that will be irrigated and the number of acres of each type of crop that will be grown.

(b) Any water bank may enter into a lease extending beyond the length of the water bank charter only if both of the following conditions are met:

(1) The water bank charter has a procedure approved by the chief engineer that sets forth how the leases will be administered if the water bank is dissolved.

(2) The bank charter assigns the responsibility and cost of administering the leases after the water bank is dissolved to a responsible person or entity.

(c) Any applicant whose application meets all the criteria in subsections (a) and (b) may enter into a contract to lease water from the water bank if sufficient water rights have been deposited in the same hydrologic unit where the point of diversion and the place of use are proposed to be located to cover the lease. (Authorized by K.S.A. 2003 Supp. 82a-769; implementing K.S.A. 2003 Supp. 82a-763 and K.S.A. 2003 Supp. 82a-769; effective Aug. 13, 2004.)

5-17-5. Contract to lease water. Any person who has an application approved by the water bank for the lease of water from the water bank may enter into a contract with the water bank to lease water. The contract shall be entered into before a term permit can be issued by the chief en-

gineer and shall include the following information and provisions:

(a) The quantity of water to be leased;

(b) the maximum rate of diversion at which the leased water will be diverted;

(c) the calendar years during which water will be leased, which shall not exceed the length of the water bank charter plus three calendar years;

(d) the location of the point of diversion where the leased water will be diverted, including the hydrologic unit;

(e) the use made of the water to be leased;

(f) the place of use of the water to be leased. The place of use shall be identical to a place of use authorized by an existing water right or approval of application, or shall be an entirely new place of use;

(g) the terms of payment for the lease of water;

(h) the penalties for breach of the lease, including those set forth in K.A.R. 5-17-13; and

(i) a provision that if the term permit is not obtained by a certain date or the term permit is dismissed for any reason, the contract shall not be exercised. (Authorized by K.S.A. 2003 Supp. 82a-769; implementing K.S.A. 2003 Supp. 82a-763 and K.S.A. 2003 Supp. 82a-769; effective Aug. 13, 2004.)

5-17-6. Conditions on the term permit to exercise a contract to lease water. (a) A contract to lease water may be exercised only if the chief engineer approves an application for a term permit to divert the leased water.

(b) The following conditions shall be imposed by the chief engineer on the term permit authorizing the use of water leased from a water bank:

(1) The maximum reasonable quantity of water that may be diverted per calendar year, as set forth in K.A.R. 5-17-17, and the maximum quantity of water that may be diverted during the term of the permit;

(2) the maximum rate of diversion;

(3) the term of the permit, which shall not exceed the length of the water bank charter plus three calendar years;

(4) the authorized point of diversion;

(5) the authorized place of use;

(6) the authorized use made of the leased water;

(7) a provision that the diversion shall not cause the impairment of any existing water rights;

(8) a provision that the diversion shall not cause an increase in depletion to any severely depleted groundwater aquifer or severely depleted stream course;

(9) a provision that the leased water shall be diverted from, and used within, the same hydrologic unit where the water rights were deposited; and

(10) a provision that any violation of a term permit used to exercise a lease shall make the permittee subject to the penalty provisions of K.A.R. 5-17-13. (Authorized by K.S.A. 2003 Supp. 82a-769; implementing K.S.A. 2003 Supp. 82a-763 and K.S.A. 2003 Supp. 82a-769; effective Aug. 13, 2004.)

5-17-7. Contract to deposit water in a safe deposit account. (a) Each person proposing to deposit water into a safe deposit account shall enter into a contract with the water bank on a form prescribed by the water bank and approved by the chief engineer. The contract shall include the following information and provisions and any other provision needed to ensure that the deposit complies with the provisions of the Kansas water banking act and regulations:

(1) The term of the contract, which shall be for a specific number of calendar years and shall not exceed the length of the water bank charter plus three years;

(2) the proposed deposit of water, which shall be from a water right that is bankable;

(3) the water right from which water is being deposited. The water right shall be in good standing and shall be vested or certified;

(4) the hydrologic unit from which water is being deposited;

(5) the terms of payment for the deposit and a provision that any fees paid are not refundable if the water user voids the contract, or causes it to be void, for any reason;

(6) the location of the point of diversion authorized by the water right that is proposed to be deposited;

(7) the water right file numbers of any linked water rights that are proposed to be deposited; and

(8) a provision that the contract shall be entered into by December 31 of the year preceding the first year for which the owner desires to make a deposit in the safe deposit account.

(b) The amount of water that may be deposited in any year shall not exceed 25 percent of the quantity of unused water from the preceding year.

(c) At the end of the term of the contract to

deposit water in a safe deposit account, including any extensions of time, all water in the account shall be forfeited.

(d) There shall not be multiple safe deposit accounts for any point of diversion.

(e) The term of a safe deposit account may be extended by the chief engineer upon request of the owner for a period not to exceed the length of the water bank charter plus three calendar years. Any water bank may extend a safe deposit account beyond the length of the water bank charter only if both of the following conditions are met:

(1) The water bank charter has a procedure approved by the chief engineer that sets forth how the safe deposit accounts will be administered if the water bank is dissolved.

(2) The bank charter assigns the responsibility and costs of administering the accounts after the water bank is dissolved to a responsible person or entity. (Authorized by K.S.A. 2003 Supp. 82a-769; implementing K.S.A. 2003 Supp. 82a-763 and K.S.A. 2003 Supp. 82a-769; effective Aug. 13, 2004.)

5-17-8. Depositing water in a safe deposit account. (a) Each calendar year in which water is deposited, the depositor shall file a deposit slip, on a form prescribed by the water bank and approved by the chief engineer, with the water bank indicating the quantity of water that was unused and the quantity of water that the depositor proposes to deposit.

(b) Water shall be deposited in an existing safe deposit account no later than March 1 of the year following the calendar year in which the water was not used.

(c) When the deposit is made, the depositor shall furnish the water bank with the following information:

(1) The water flowmeter readings at the beginning and end of the calendar year in which the water was not used under the water right; and

(2) the quantity of water proposed to be deposited.

(d) The water bank shall accept for deposit the quantity of water that meets the provisions of the water bank charter and the Kansas water banking act and regulations. (Authorized by K.S.A. 2003 Supp. 82a-769; implementing K.S.A. 2003 Supp. 82a-763 and K.S.A. 2003 Supp. 82a-769; effective Aug. 13, 2004.)

5-17-9. Term permit to use water that was deposited in a safe deposit account. (a) Before approval of a term permit to use water deposited in a safe deposit account, the water bank shall certify to the chief engineer the quantity of water that is in the safe deposit account.

(b) Before any water that has been deposited into a safe deposit account may be used, the applicant shall apply for a term permit, submit the appropriate filing fee, and receive approval from the chief engineer. Each term permit shall contain the following conditions:

(1) The maximum rate of diversion of water;

(2) the maximum quantity of water that may be diverted the remainder of that calendar year, which shall not exceed the quantity of water certified by the water bank to be in the safe deposit account;

(3) the length of the term permit, which shall not exceed December 31 of the year in which the term permit was issued by the chief engineer. No extensions of time shall be granted for this type of term permit;

(4) a provision that the use of water under the term permit shall not impair any existing water rights;

(5) a provision that the use of water under the term permit shall not cause an increase in the depletion of a severely depleted groundwater aquifer or severely depleted stream course; and

(6) a provision that violation of any of the terms of the term permit shall subject the owner to the penalty provisions of K.A.R. 5-17-13. (Authorized by K.S.A. 2003 Supp. 82a-769; implementing K.S.A. 2003 Supp. 82a-763 and K.S.A. 2003 Supp. 82a-769; effective Aug. 13, 2004.)

5-17-10. Water bank charter proposal. (a) Each proposed water bank charter submitted to the chief engineer shall contain all of the following:

(1) Information showing that the proposed operations and policies of the water bank are consistent with the Kansas water banking act, the Kansas water appropriation act and regulations, the Kansas state water plan, the policies of any groundwater management district that is located within the boundaries of the proposed water bank, and the water assurance district operation agreements of any water assurance district located within the boundaries of the proposed water bank;

(2) information that demonstrates that there is sufficient participation to make the water bank's

operations practical and feasible, including economically;

(3) a petition declaring an intent to establish a water bank that is signed by at least five percent of the water right owners within the water bank's proposed boundaries;

(4) the names of at least five members of the proposed governing body of the water bank, their addresses, and the public and private interests that each represents;

(5) the proposed boundaries of the water bank, including information showing that the boundaries of the proposed water bank do not overlap the boundaries of another water bank;

(6) for groundwater banks, an enumeration of all the hydrologic units and sources of water supply within the water bank boundaries, including alluviums, terrace deposits, and regional aquifers, both confined and unconfined, that have similar aquifer properties. The aquifer properties shall include the saturated thickness and water level changes over the representative past period;

(7) for a water bank that includes surface water, a list of the streams and their tributaries that are to comprise the water bank and a methodology to limit the leasing of surface water so that it does not impair senior surface water rights and minimum desirable streamflow;

(8) the designation of a representative past period;

(9) a comprehensive method to account for the following:

(A) The amount of water deposited and the length of the contracts for deposit;

(B) the amount of water leased from the water bank and the length of the lease contracts; and

(C) the identification of the hydrologic units from which deposits and leases are being made;

(10) for a water bank that includes the use of groundwater, a proposed plan to ensure that the net amount of water consumed by the deposited water rights will be at least 10 percent less than the average net amount of water consumed by the deposited water rights for the representative past period. The proposed plan shall require the comparison of the average annual net consumption for the deposited water rights for the five-year period after a water bank is chartered or rechartered with the average net consumptive use for the deposited water rights for the representative past period;

(11) a list of any severely depleted groundwater aquifers or severely depleted stream courses;

(12) a plan to ensure that there will be no increase in the depletion of severely depleted groundwater aquifers or severely depleted stream courses;

(13) a method for determining the water rights that are bankable and the portion that is bankable;

(14) a procedure for dissolution of the water bank;

(15) for a bank using groundwater, a methodology for ensuring that the total quantity of groundwater leased each year does not exceed 90 percent of the average annual quantity collectively diverted pursuant to all deposited water rights or portions of water rights from each hydrologic unit for the representative past period;

(16) for a water bank that authorizes safe deposit accounts, a methodology to ensure that the users of safe deposit accounts will not increase the consumption of groundwater; and

(17) for a water bank that authorizes safe deposit accounts, a provision setting the maximum percentage of unused water from the previous year that may be deposited in a safe deposit account.

(b) After the body wishing to charter the water bank submits the proposed water bank charter to the chief engineer, it shall be circulated by the chief engineer to any groundwater management districts and water assurance districts located within the boundaries of the proposed water banks and to the Kansas water office for comments as to whether the proposed water bank charter complies with the provisions of K.S.A. 82a-765, and amendments thereto. Comments regarding the proposed water bank charter shall be due within 30 days after comments are requested by the chief engineer, unless an extension of time is requested within the time allowed and granted by the chief engineer for good cause shown. (Authorized by K.S.A. 2003 Supp. 82a-769; implementing K.S.A. 2003 Supp. 82a-765 and K.S.A. 2003 Supp. 82a-769; effective Aug. 13, 2004.)

5-17-11. Annual reports of water banks. Each water bank shall file an accounting report with the chief engineer each calendar year containing the following information: (a) The file numbers of the water rights, or portion of the water rights, deposited in the water bank;

(b) the annual quantity of water authorized for diversion for each water right deposited and a determination of the bankable quantity of water associated with each deposited water right;

(c) the term of each deposit;

(d) the hydrologic unit from which each water right was deposited;

(e) the file number of each term permit authorizing a lease of water;

(f) the term of the lease;

(g) the annual quantity of water that has been leased from each hydrologic unit;

(h) the hydrologic units where the leased water was diverted;

(i) the net year-end balance of water deposited versus water leased in each hydrologic unit within the water bank's boundaries;

(j) the annual quantity of water deposited into safe deposit accounts;

(k) the annual quantity of water used from safe deposit accounts;

(l) the hydrologic unit in which water was deposited in a safe deposit account;

(m) the total year-end balance of water remaining in safe deposit accounts after the 10 percent year-end reduction for all individual accounts;

(n) the total quantity of water diverted during the last three calendar years, by type of use;

(o) the total number of acres irrigated and the number of acres of each crop grown during the last three calendar years;

(p) any contracts that were breached, the nature of the breaches, and the enforcement actions taken by the water bank; and

(q) the average annual quantity of water diverted during the representative past period of each water right that has been deposited in the water bank. (Authorized by K.S.A. 2003 Supp. 82a-769; implementing K.S.A. 2003 Supp. 82a-766 and K.S.A. 2003 Supp. 82a-769; effective Aug. 13, 2004.)

5-17-12. Water use reports. (a) Each owner of a water right authorized for irrigation use that deposits a water right in a water bank or deposits water in a safe deposit account, and each person that leases water for irrigation use and any linked water rights, shall file the water use report required by K.S.A. 82a-732, and amendments thereto, on or before December 1 of the year for which water use is being reported.

(b) Each owner of a water right authorized for non-irrigation use that deposits a water right in a water bank or deposits water in a safe deposit account, and each person that leases water for non-irrigation use and any linked water rights, shall file the water use report required by K.S.A. 82a-732, and amendments thereto, on or before January 10 of the year following the year for which water use is being reported.

(c) The failure of a water right owner to submit a complete and accurate water use report, including water flowmeter readings, as required by this regulation shall result in civil fines in the amounts set forth in K.A.R. 5-14-11.

(d) If a water use report is inadequate to accurately determine the actual water use during any calendar year, then that year shall be counted as having had no water use for the purpose of determining the extent to which a water right is bankable pursuant to K.S.A. 82a-764, and amendments thereto, unless the water use report is corrected as set forth in K.A.R. 5-3-5o. (Authorized by K.S.A. 2003 Supp. 82a-769; implementing K.S.A. 2003 Supp. 82a-766 and K.S.A. 2003 Supp. 82a-769; effective Aug. 13, 2004.)

5-17-13. Enforcement. If any person violates any of the following, enforcement action may be taken by the chief engineer as specified in K.A.R. 5-14-1 and K.A.R. 5-14-10:

(a) A term, condition, or limitation of a term permit issued to authorize the diversion of leased water;

(b) a term, condition, or limitation of a term permit issued to withdraw water from a safe deposit account;

(c) a term, condition, or limitation of a water right that has been deposited in the water bank or a safe deposit account;

(d) any order of the chief engineer concerning the deposit or lease of a water right; or

(e) any order or condition placed on the use of the remainder of a water right that was partially deposited in the water bank or a safe deposit account. (Authorized by K.S.A. 2003 Supp. 82a-769; implementing K.S.A. 2003 Supp. 82a-769 and K.S.A. 2003 Supp. 82a-770; effective Aug. 13, 2004.)

5-17-14. Water flowmeters. (a) The following points of diversion shall meet the requirements specified in subsection (b):

(1) Within a groundwater bank, all non-domestic, non-temporary wells within the boundaries of the water bank;

(2) within a surface water bank, all non-domestic, non-temporary surface water points of diversion within the boundaries of the water bank; and

(3) within a groundwater and surface water bank, all non-domestic, non-temporary points of diversion within boundaries of the water bank.

(b) While a water bank is operating, each of the points of diversion described in subsection (a) shall meet one of the following requirements:

(1) Be equipped with a water flowmeter meeting the requirements of K.A.R. 5-1-4 through K.A.R. 5-1-12;

(2) be sealed by the chief engineer; or

(3) be approved by the chief engineer as having another objectively verifiable means of determining that water has not been pumped, including capping the well, removal of the pump, or removal of a permanent power source.

(c) If a water flowmeter does not function properly whenever water is being diverted, it shall be assumed, for the purpose of determining compliance with the water right and the term permit issued to withdraw leased water or water deposited in a safe deposit account, that the diversion works have been operated continuously at the tested rate of diversion since the last time the waterflow meter was confirmed by the chief engineer or a groundwater management district to have been operating properly. If the diversion works have not been tested by the chief engineer or a groundwater management district, it shall be assumed that the diversion works have been operated continuously at the authorized rate of diversion during the entire time the water flowmeter was out of compliance. Either of the assumptions specified in this subsection may be rebutted if the water right owner submits objective documentation of the actual quantity of water diverted while the water flowmeter was out of compliance. (Authorized by K.S.A. 2003 Supp. 82a-769; implementing K.S.A. 2003 Supp. 82a-766 and K.S.A. 2003 Supp. 82a-769; effective Aug. 13, 2004.)

5-17-15. Private sale or lease of water right facilitated by a water bank. If a water bank provides services to facilitate the sale or lease of water rights, the owner of the water rights that are bought, sold, or leased between private parties shall be required to comply with all applicable statutes and regulations, including any regulation of the chief engineer limiting the distance that a point of diversion may be moved. (Authorized by K.S.A. 2003 Supp. 82a-769; implementing K.S.A. 2003 Supp. 82a-763 and K.S.A. 2003 Supp. 82a-769; effective Aug. 13, 2004.)

5-17-16. Priority of use of water rights and permits. (a) If multiple water rights or permits authorize the use of water from a single point of diversion, the water shall be considered to be used in the order of priority with the earliest priority first.

(b) If the water used exceeds the total quantity of water authorized by the water rights and permits described in subsection (a) that authorize water use from that point of diversion, all water rights and permits under which the water was lawfully diverted shall be deemed to be violated unless this presumption is rebutted by one or more of the water right owners. (Authorized by K.S.A. 2003 Supp. 82a-769; implementing K.S.A. 2003 Supp. 82a-769 and K.S.A. 2003 Supp. 82a-770; effective Aug. 13, 2004.)

5-17-17. Waste of leased water and safe deposit account water. For using leased water or water withdrawn from a safe deposit account, the quantity not considered to be waste for irrigation use shall be 150 percent of the value specified in K.A.R. 5-3-24 for the county where the point of diversion is located. (Authorized by K.S.A. 2002 Supp. 82a-769; implementing K.S.A. 2002 Supp. 82a-763 and K.S.A. 2002 Supp. 82a-769; effective Aug. 13, 2004.)

5-17-18. Reimbursable and non-reimbursable costs. (a) The following costs incurred by the chief engineer for assistance and services to implement the Kansas water banking act shall be reimbursable by a water bank:

(1) The cost of reviewing and approving a proposed water bank charter;

(2) the cost of determining the extent to which a water right is bankable and in good standing;

(3) the cost of reviewing an annual report filed by a water bank and conducting the analysis necessary to determine if the water bank has complied with the terms of the Kansas water banking act;

(4) extra costs incurred to require water use reports to be filed earlier than March 1, the tracking of that information, and reporting that information to a water bank;

(5) increased costs incurred to provide other water use and water right information to water banks or water bank customers;

(6) the costs to monitor and enforce the provisions of the Kansas water banking act;

(7) the costs of meetings and other discussions with water bank officials and employees;

(8) the cost of enforcement of terms, conditions, and limitations of term permits issued to

allow withdrawal of leased water and water from safe deposit accounts;

(9) if additional enforcement of water rights and permits is requested by a water bank, enforcement costs that would not have been incurred by the chief engineer in the ordinary course of business against all water rights diverting water from within the boundaries of the water bank to prevent overpumping; and

(10) the cost incurred if a water bank or a water bank customer requests the chief engineer to hold an abandonment hearing necessary to determine whether a water right is bankable that would not have been done in the ordinary course of business by the chief engineer at that time.

(b) The following costs incurred by the chief engineer for assistance and services to implement the Kansas water banking act shall not be reimbursable by a water bank:

(1) The cost of issuing a term permit to allow diversion of leased water;

(2) the cost of issuing a term permit to allow withdrawal of water from a safe deposit account;

(3) enforcement costs that the chief engineer would have incurred in the ordinary course of business to take action against all water rights diverting water from within the boundaries of the water bank to prevent overpumping; and

(4) the cost of adopting regulations to implement the act. (Authorized by K.S.A. 2002 Supp. 82a-769; implementing K.S.A. 2002 Supp. 82a-769 and K.S.A. 2002 Supp. 82a-771; effective Aug. 13, 2004.)

Articles 18 to 20.—RESERVED

Article 21.—WESTERN KANSAS GROUNDWATER MANAGEMENT DISTRICT NO. 1

5-21-1. Definitions. As used in these rules and regulations, the following words and phrases shall have the meaning ascribed to them in this section.

(a) "Aquifer" means a geologic water-bearing formation that will yield considerable quantities of water to wells and springs.

(b) "Board" means the board of directors constituting the governing body of the western Kansas groundwater management district no. 1.

(c) "Chief engineer" means the chief engineer of the division of water resources of the Kansas state board of agriculture.

(d) "District" means the western Kansas groundwater management district no. 1.

(e) "Authorized representative of the board" means an individual designated by the board to perform duties and functions on its behalf.

(f) "Groundwater" means water below the surface of the earth.

(g) "Substantially" means within 300 feet of the approved location, but in no case closer to other wells than the minimum spacing requirements allow.

(h) "Tailwater" means that portion of the irrigation water applied which appears as run-off from the authorized place of use.

(i) "Tailwater re-use system" means a facility to collect, store and transport irrigation tailwater for reapplication to the authorized place of use.

(j) "Unconsolidated aquifer" means unconsolidated deposits that will yield water in a sufficient quantity to supply pumping wells and springs.

(k) "Waste of water" means any act or omission which causes:

(1) groundwater to be diverted or withdrawn from a source of supply and not used, managed or reapplied to a beneficial use on or in connection with land authorized as the place of use by a vested right, an appropriation right or an approved application for permit to appropriate water for beneficial use;

(2) the unreasonable deterioration of the quality of water in any source of supply thereby causing impairment of a person's right to the use of water;

(3) groundwater intended for irrigation use to escape and drain from the authorized place of use; or

(4) groundwater to be applied to an authorized beneficial use in excess of the needs for such use.

(l) "Well" means any excavation that is drilled, cored, bored, washed, driven, dug or otherwise constructed when the intended use of such excavation is for the acquisition, diversion, or artificial recharge of groundwater. (Authorized by K.S.A. 82a-1028(o); effective May 1, 1979; amended May 23, 1994.)

5-21-2. Tailwater control and waste. No water user shall allow water which is pumped or diverted from any aquifer to leave the land under the water user's direct supervision and control. If the water is re-used, the user shall apply the water consistent with the approved application to appropriate water for beneficial use, vested right, or

appropriation right. All water users shall construct and operate the water distribution systems in a manner as to prevent waste of water, and shall do everything necessary and proper to preserve the quality of the groundwater resources within the district. (Authorized by K.S.A. 1978 Supp. 82a-1028(o); effective May 1, 1979.)

5-21-3. Well spacing requirements. (a) Each well location described in an application for a permit to appropriate water for a beneficial use, other than domestic use, which proposes the diversion or withdrawal of water from the Ogallala formation shall be spaced a minimum of 2640 feet from all other non-domestic wells in the Ogallala aquifer.

(b) (1) Each well location described in an application to appropriate water for a beneficial use, other than domestic use, which proposes the diversion or withdrawal of water from the Dakota aquifer shall be spaced a minimum of two thousand six hundred forty (2,640) feet from any other well constructed into the same Dakota aquifer.

(2) Each Dakota well shall be sealed off between the Dakota aquifer and any other aquifers in such a manner as to prevent migration of water to or from the Dakota aquifer and any other aquifers.

(c) Each well included in an application to appropriate water for a beneficial use, other than domestic use, which proposes the diversion or withdrawal of water shall be a minimum of 1,320 feet away from a domestic well constructed into the same aquifer unless the applicant has received written permission from the neighboring well owner or the domestic wells are owned by the applicant.

(d) The location of a well or wells on an application for approval to change the point of diversion under an existing water right shall be no more than 1,320 feet from the originally authorized point of diversion and shall:

(1) not decrease the distance to other wells or authorized well locations by more than 300 feet; or

(2) meet the minimum well spacing requirements in this regulation.

(e) A new well shall be drilled in a location substantially as shown on the approved application and the accompanying map, plat, or aerial photograph.

(f) Exceptions to this well spacing regulation may be granted on an individual basis by recommendation of the board in conjunction with the approval of the chief engineer. The applicant may be required by the board to submit information as it deems necessary in order to make the determination. (Authorized by K.S.A. 82a-1028(o); effective May 1, 1979; amended May 23, 1994.)

5-21-4. Safe yield. (a) Except as set forth in subsection (c), the district shall be closed to further new appropriations of water in all areas where the total saturated thickness of the unconsolidated aquifer, commonly known as the Ogallala, meets either of these criteria:

(1) Has been depleted by 15 percent or more since 1950, as determined according to K.A.R. 5-21-8; or

(2) is less than 40 feet thick, as determined according to K.A.R. 5-21-9.

(b) In the rest of the district, the approval of each application for a permit to appropriate water for a beneficial use, except as set forth in subsection (c), from the Ogallala aquifer, and the approval of each application for a change in the point of diversion if the diversion works have not been completed under the original approved application, shall be subject to the following criteria:

(1) The proposed appropriation, when added to the vested rights, prior appropriation rights, and earlier priority applications, shall not exceed the allowable safe yield amount for the area included within a two-mile-radius circle, which is approximately 8,042 acres, of the proposed well.

(2) For the purpose of analysis, all vested rights, certificates, permits, and prior unapproved applications shall be considered to be fully exercised, and all limitation clauses listed on permits to appropriate water and certificates shall be considered to be in force.

(3) In the case of an application for change in the point of diversion referred to in subsection (b), each application and water right with a priority earlier than the priority established by the filing of the application for change shall be included in the analysis.

(4) The allowable annual safe yield amount shall be calculated using the following formula:

$$Q = \frac{AR}{12}$$

Q = the allowable annual safe yield amount in acre-feet per year

A = area of consideration, within a two-mile-radius circle, approximately 8,042 acres

R = average annual recharge of 0.5 inches per year

(5) If part of the radial area is located outside the district boundary, it shall be included in the depletion analysis only if the chief engineer determines that hydraulically connected groundwater exists in that portion of the area outside the district. A part of the area of consideration lying outside the state of Kansas shall not be included in the analysis.

(6) If wells authorized under a vested right, a certified water right, or a permit to appropriate water are divided by the circumference of the radial area, the authorized quantity of water shall be assigned to each well. If specific quantities are not authorized for each well, a proportional amount shall be assigned to each well.

(c) This regulation shall not apply to the following:

(1) Domestic use;

(2) temporary permits; and

(3) a new application filed to appropriate groundwater in any area of the district not closed by regulation or intensive groundwater use control area order by the chief engineer to new nondomestic, nontemporary permits and term permits for five or fewer years, meeting all of the following criteria:

(A) The sum of the annual quantity requested by the proposed appropriation and the total annual quantities authorized by prior permits allowed because of an exemption pursuant to this subsection does not exceed 15 acre-feet in a ½-mile-radius circle surrounding the proposed point of diversion.

(B) Well spacing criteria in the area have been met.

(C) The approval of the application does not authorize an additional quantity of water out of an existing authorized well with a nondomestic permit or water right that would result in a total combined annual quantity of water authorized from that well in excess of 15 acre-feet.

(D) All other criteria for approving a new application to appropriate water at that location have been met.

(d) Exceptions to this regulation may be granted on an individual basis by recommendation by the board in conjunction with the approval of the chief engineer. The applicant may be required by the board to submit information necessary in order to make the determination. (Authorized by K.S.A. 82a-706a and K.S.A. 82a-1028(o); implementing K.S.A. 82a-1028(n); effective May 23, 1994; amended Sept. 22, 2000.)

5-21-5. Battery of wells. Within the boundaries of the district, an application for change of point of diversion from one well to a battery of wells shall not be approved unless the application meets the following criteria:

(a) The proposed points of diversion constitute a "battery of wells" as defined in K.A.R. 5-1-1.

(b) If the application for change has been filed pursuant to an appropriation right, the certificate shall be issued before approval of the application for change.

(c) The maximum annual quantity and maximum instantaneous diversion rate approved shall not exceed the maximum annual quantity and the maximum instantaneous diversion rate actually used during any of the three consecutive full calendar years before the application.

(d) The application meets the criteria for the approval of a new application. However, the wells comprising the battery of wells shall not be required to meet the well spacing requirements of K.A.R. 5-21-3 in relationship to each other. (Authorized by K.S.A. 82a-706a and K.S.A. 82a-1028(o); implementing K.S.A. 82a-1028(n); effective Sept. 22, 2000.)

5-21-6. Water-measuring devices. (a) Except as specified in subsections (b) and (e), each well authorized after the effective date of this regulation within the boundaries of the district shall be equipped with a water flowmeter that is installed and maintained in accordance with the specifications in K.A.R. 5-1-4 through 5-1-12. Each water right owner shall maintain the water flowmeter so that the flowmeter functions properly whenever the diversion of water can reasonably be expected to occur. If the water flowmeter fails to function properly, the owner shall promptly initiate action to repair or replace the meter, or to correct any problems with the installation.

(b) If the owner of the water right demonstrates to the board that the installation of a water flowmeter meeting the requirements of subsection (a) is not feasible, the installation of an hour meter in lieu of a water flowmeter may be approved by the board. Installation of a water flowmeter shall be considered to be not feasible if all of the following conditions are met:

(1) The diversion works and the delivery sys-

tem are both in existence before the order of the board to install a water-measuring device.

(2) The owner enters into a written agreement with the district providing that the owner will perform the following:

(A) Notify the district whenever the diversion works or the delivery system is modified; and

(B) install a water flowmeter when the diversion works or delivery system is modified, unless a waiver is granted by the board.

(3) Either of the following conditions is met:

(A) The normal operating rate of diversion is less than 200 gallons per minute.

(B) The diameter of the existing pipe is too large for the normal operating flow rate so that full pipe flow cannot be maintained through a water flowmeter.

(c) Each well location authorized before the effective date of this regulation and located within the boundaries of the district shall be equipped with a water-measuring device that was acceptable at the time the water-measuring device was required. Waivers or exemptions to the installation of a water flowmeter granted by the district before the effective date of this regulation shall be considered to be effective until one of the following occurs:

(1) The well is redrilled.

(2) The delivery system is modified.

(3) The water-measuring device is no longer functioning properly and is not promptly repaired.

(4) The district or the chief engineer orders that the well be equipped with a water flowmeter.

(d) An hour meter installation shall be deemed acceptable if all of the following requirements are met:

(1) The hour meter shall be enclosed in a weatherproof box and installed on a stand or post separate from, but adjacent to, the pumping plant base.

(2) The wiring from the pumping plant to the hour meter shall be at least 16 gauge and shall be enclosed in a conduit.

(3) All electrical connections shall be firmly attached.

(e) The following types of water use shall be exempt from the requirements of this regulation:

(1) Domestic use; and

(2) temporary use. (Authorized by K.S.A. 82a-706a and K.S.A. 82a-1028, as amended by L. 2002, Ch. 137, § 5; implementing K.S.A. 82a-1028, as amended by L. 2002, Ch. 137, § 5 and K.S.A. 2001 Supp. 82a-1903, as amended by L. 2002, Ch. 137, § 7; effective Jan. 24, 2003.)

5-21-7. Change in the use made of water from irrigation use to any other type of beneficial use. A change in the use made of water from irrigation use to any other type of beneficial use shall not be approved if any of the following conditions is met: (a) The application for change does not meet the requirements of K.A.R. 5-5-9.

(b) The rate of diversion applied for exceeds the rate of diversion as determined by a test of the normal operating rate of diversion conducted within 1,095 days before the date the application for change was filed.

(c) The maximum annual quantity of water applied for is in excess of any of the following:

(1) The maximum annual quantity of water determined for a vested right;

(2) the maximum annual quantity of water certified; or

(3) the average annual quantity of water actually used in the preceding 10 calendar years, excluding those years in which the water right was enrolled in the water right conservation program, the conservation reserve program, or any other multiyear water conservation program approved by the chief engineer. (Authorized by K.S.A. 82a-706a and K.S.A. 82a-1028, as amended by L. 2002, Ch. 137, § 5; implementing K.S.A. 82a-1028, as amended by L. 2002, Ch. 137, § 5 and K.S.A. 2001 Supp. 82a-1903, as amended by L. 2002, Ch. 137, § 7; effective Jan. 24, 2003.)

5-21-8. Percent change of saturated thickness. The map titled "percent change in saturated thickness of the High Plains aquifer, west central Kansas, 1950 to average 1997-1999" and designated as the Kansas geological survey open file report 2000-15B, dated July 25, 2000, is hereby adopted by reference. (Authorized by K.S.A. 82a-706a and K.S.A. 82a-1028(o); implementing K.S.A. 82a-1028(n); effective Sept. 22, 2000.)

5-21-9. Saturated thickness. The map titled "saturated thickness of unconsolidated aquifer, west central Kansas average 1997-1999" and designated as the Kansas geological survey open file report 2000-15A, dated July 25, 2000, is hereby adopted by reference. (Authorized by K.S.A. 82a-706a and K.S.A. 82a-1028(o); implementing K.S.A. 82a-1028(n); effective Sept. 22, 2000.)

Article 22.—EQUUS BEDS GROUNDWATER MANAGEMENT DISTRICT NO. 2

5-22-1. Definitions. As used in article 22 of these regulations, by the Equus Beds groundwater management district no. 2 in the implementation of the groundwater management district act and by the division of water resources in the administration of the Kansas water appropriation act, the following terms shall have the meanings ascribed to them in this regulation, unless the context clearly requires otherwise.

(a) "Above-baseflow stage" means streamflow that is in response to a significant runoff event during which period the water-level elevation of the stream is greater than the elevation of the adjacent water table.

(b) "Aquifer" means any geologic formation capable of yielding water in sufficient quantities that it can be diverted for beneficial use.

(c) "Aquifer storage" means the act of storing water in the unsaturated portion of an aquifer by artificial recharge for subsequent diversion and beneficial use.

(d) "Aquifer storage and recovery system" means a physical infrastructure that meets the following conditions:

(1) Is constructed and operated for artificial recharge, storage, and recovery of source water; and

(2) consists of apparatus for diversion, treatment, recharge, storage, extraction, and distribution.

(e) "Area of consideration" means the two-mile-radius circle whose center is the location of the proposed point of diversion. The area of consideration equals 8,042 acres minus the area of the circle that meets the following conditions:

(1) Is outside the district boundary;

(2) is inside an intensive groundwater use control area with a declining water table; and

(3) is in an area where the bedrock is not overlain by an aquifer.

(f) "Artificial recharge" means the use of source water to artificially replenish the water supply in an aquifer.

(g) "Bank storage" means water absorbed by and temporarily stored in the banks and bed of a stream during above-baseflow stage.

(h) "Bank storage well" means a well used to divert or withdraw water from bank storage.

(i) "Baseflow" means groundwater that seeps, flows, or is otherwise naturally discharged from an aquifer into a stream.

(j) "Baseflow allocation" means the annual quantity of water assigned to a baseflow node expressed in acre-feet per calendar year. The natural discharge to the stream shall be assumed to be equivalent to the rate of flow in the stream that is equaled or exceeded 90 percent of the time.

(k) "Baseflow node" means an artificial point located in the channel of a watercourse for the purpose of allocating a proportional amount of the baseflow.

(l) "Basin storage area" means the portion of the aquifer's unsaturated zone used for aquifer storage that has defined horizontal boundaries and is delimited by the highest and lowest index water levels.

(m) "Basin storage loss" means that portion of artificial recharge naturally flowing or discharging from the basin storage area.

(n) "Battery of wells" means either of the following:

(1) A group of two or more wells that meets the following conditions:

(A) Withdraws water from the same local source of supply;

(B) is connected to a common pump by a manifold or piping; and

(C) supplies water to a common distribution system; or

(2) a group of not more than four wells that meets the following conditions:

(A) Withdraws water from the same local source of supply;

(B) is located within a 300-foot-radius circle of the geographic center of the battery of wells;

(C) supplies water to a common distribution system;

(D) does not exceed a combined capacity of 800 gallons per minute; and

(E) has an individual pump installed in each well with a maximum capacity of 400 gallons per minute.

A battery of wells shall be considered to be one point of diversion.

(o) "Board" means the board of directors constituting the governing body of the Equus Beds groundwater management district no. 2.

(p) "Completed substantially as shown on aerial photograph, topographic map, or plat" means within 300 feet of the location as shown on the aerial photograph, topographic map, or plat accompanying the application.

(q) "Confined aquifer" means either of the following:

(1) An aquifer overlain and underlain by impermeable layers; or

(2) an aquifer in which the groundwater is under pressure greater than atmospheric pressure and will rise in a well above the elevation at which groundwater is first encountered.

(r) "Conjunctive use" means the management of the aquifer to achieve safe yield and the operation of the aquifer in coordination with a surface water system to enhance the use of the total water supply availability, in accordance with the provisions of the Kansas water appropriation act.

(s) "Consumptive use" means gross diversion minus the following:

(1) Waste of water; and

(2) return flows to the source of water supply by at least one of the following:

(A) Through the surface water runoff that is not waste; and

(B) by deep percolation.

(t) "District" means the Equus Beds groundwater management district no. 2.

(u) "Free-water surface" means water that is exposed to the atmosphere, including lakes, ponds, and pits that intercept the water table.

(v) "Geographic center" means either of the following:

(1) The arithmetic mean of the northing and westing coordinates or measurements for each well in a battery of wells; or

(2) the apparent center of a groundwater pit.

(w) "Groundwater" means water below the surface of the earth.

(x) "Groundwater pit" means an excavation in the earth that meets all of the following criteria:

(1) Exposes the current or historic groundwater table;

(2) has caused, or will likely cause, annual evaporation of groundwater; and

(3) has a perimeter equal to or greater than the depth of the excavation.

(y) "Index water level" means water-level elevations established spatially throughout a basin storage area to be used to represent the maximum volume of a basin storage area and the volume of stored water available for recovery, based upon accounting methodology and the conditions of the permit.

(z) "Non-consumptive use" means the beneficial use of water in which essentially all of the water diverted from the source of supply is returned to the source of supply.

(aa) "Person" means a natural person, a partnership, an organization, a corporation, a municipality, and any agency of the state or federal government.

(bb) "Point of diversion" means the point at which water is diverted or withdrawn from a source of water supply.

(cc) "Primary well" means a well equipped with a flowmeter for which a standby well is available.

(dd) "Recharge" means the natural infiltration of surface water or rainfall into an aquifer from its catchment area.

(ee) "Recharge credit" means the quantity of water that is stored in a basin storage area and that is available for subsequent appropriation for beneficial use by the operator of the aquifer storage and recovery system.

(ff) "Safe yield" means the total quantity of groundwater meeting the following conditions:

(1) Can be artificially withdrawn from an aquifer; and

(2) naturally discharges to a stream without exceeding the aquifer recharge value for the area of consideration and without impairing the water rights diverting from the aquifer.

(gg) "Standby well" means a well that meets the following conditions:

(1) Is used to provide water for any of the following:

(A) Fire protection;

(B) emergency purposes; or

(C) any period during which the primary well has mechanical failure, maintenance, or power failure;

(2) is maintained in good operating condition;

(3) withdraws water from the same source of supply as the primary well;

(4) is located within 300 feet of the primary well;

(5) is limited to the same rate and quantity authorized by the primary well's appropriation or vested right;

(6) is equipped with a flowmeter; and

(7) is operated only when water is temporarily unavailable from the primary well or wells, except when water is needed for fire protection or a similar type of emergency.

(hh) "Stream" means any watercourse that has a well-defined bed and well-defined banks, and that flows continuously during the calendar year, except during periods of drought.

(ii) "Surface water" means water in creeks, rivers, or other watercourses, and in reservoirs, lakes, and ponds. This term shall not include water in groundwater pits.

(jj) "Thermal exchange" means the use of water for climate control in a nondomestic building and in a manner that is essentially nonconsumptive to the source of supply.

(kk) "Unconfined aquifer" means an aquifer with a water table at atmospheric pressure.

(ll) "Waste of water" means any act or omission that causes any of the following:

(1) The diversion or withdrawal of water from a source of supply that is not used or reapplied to a beneficial use on or in connection with the place of use authorized by a vested right, an appropriation right, or an approval of application for a permit to appropriate water for beneficial use;

(2) the unreasonable deterioration of the quality of water in any source of supply, thereby causing impairment of a person's right to the use of water;

(3) the escaping and draining of water intended for irrigation use from the authorized place of use; or

(4) the application of water to an authorized beneficial use in excess of the needs for this use.

(mm) "Water balance" means the method of determining the amount of water in storage in a basin storage area by accounting for inflow to, outflow from, and changes in storage in that basin storage area.

(nn) "Water table" means the top or surface of an unconfined or confined aquifer at which the pore water pressure is atmospheric.

(oo) "Well" means any excavation that is drilled, cored, bored, washed, driven, dug, or otherwise constructed if the intended use of the excavation is for the acquisition, diversion, or artificial recharge of groundwater. (Authorized by and implementing K.S.A. 82a-706a and K.S.A. 2003 Supp. 82a-1028; effective May 1, 1979; amended Oct. 15, 1990; amended March 7, 1994; amended Nov. 12, 2004.)

5-22-2. Well spacing requirements. (a) Except as specified in subsections (d) and (e), the minimum spacing of all nondomestic and nontemporary wells described in an application for permit to appropriate water for beneficial use, an application for a term permit, or application to change the point of diversion shall be the following:

(1) 1,320 feet from all nondomestic wells, groundwater pits, and baseflow nodes; and

(2) 660 feet from all domestic wells.

(b) The minimum spacing interval from the geographic center of a battery of wells to each nondomestic well, groundwater pit, and baseflow node shall be 1,620 feet. The minimum spacing interval from the geographic center of a battery of wells to each domestic well shall be 960 feet.

(c) The minimum spacing interval from the edge of a groundwater pit to each nondomestic well, the edge of any other groundwater pit, and baseflow node shall be 1,320 feet and 330 feet to a domestic well.

(d)(1) In the areas described in the following table, the requirements specified in paragraphs (2), (3), and (4) of this subsection shall apply:

Township	Range	Section	County
23 South	6 West	31, 32 and 33	Reno
23 South	7 West	31 through 36	Reno
24 South	6 West	4 through 9, and 13 through 36	Reno
24 South	7 West	1 through 36	Reno
25 South	5 West	30 and 31	Reno
25 South	6 West	1 through 36	Reno
25 South	7 West	1 through 36	Reno
26 South	5 West	6, 7, and 8; 17 through 21; and 27 through 35	Reno
26 South	6 West	1 through 36	Reno
26 South	7 West	1 through 36	Reno

(2) The minimum spacing of all nondomestic and nontemporary wells with an authorized rate of diversion of 401 gallons per minute or more, as described in an application for permit to appropriate water for beneficial use, term permit, or application to change the point of diversion, shall be the following:

(A) 2,640 feet from all other nondomestic wells, groundwater pits, and baseflow nodes; and

(B) 660 feet from all domestic wells.

(3) The minimum spacing of a battery of wells with a total authorized rate of diversion of 401 gallons per minute or more, as described in an application for permit to appropriate water for beneficial use, term permit, or application to change the point of diversion shall be the following:

(A) 2,940 feet from all nondomestic wells, groundwater pits, and baseflow nodes; and

(B) 960 feet from all domestic wells.

(4) The minimum spacing interval from the

edge of a groundwater pit to each nondomestic well, the edge of any other groundwater pit, and baseflow node shall be 1,320 feet. The minimum spacing interval from the edge of a groundwater pit to a domestic well shall be 330 feet.

(e) The following types of wells shall not be subject to this well-spacing regulation:

(1) A standby well;

(2) a bank storage well;

(3) a well authorized pursuant to the approval of an application to change the point of diversion that meets both of the following conditions:

(A) The number of wells comprising the point of diversion remains unchanged; and

(B) each point of diversion is proposed to be relocated 300 feet or less from the currently authorized location;

(4) the minimum spacing interval of nondomestic wells to domestic wells, if the domestic well owner has granted written permission to reduce the spacing interval; and

(5) the minimum spacing interval of groundwater pits to nondomestic, nontemporary, or domestic wells, if the well owner has granted written permission to reduce the spacing interval. (Authorized by and implementing K.S.A. 82a-1028, as amended by L. 2002, Ch. 137, § 5; effective May 1, 1979; amended Oct. 15, 1990; amended March 7, 1994; amended Jan. 10, 2003.)

5-22-3. Waste of water. It shall be a violation of these rules and regulations for any person, private corporation, public corporation, municipality, company, institution, township, county, state agency or federal agency to waste water as defined in these regulations. (Authorized by K.S.A. 1978 Supp. 82a-1028(o); effective May 1, 1979.)

5-22-4. Metering. (a) Each water flowmeter, gauge, or other measuring device required by the district shall meet the minimum specifications adopted by the chief engineer by regulation.

(b) The owner of the water right or approval of application shall perform the following:

(1) Ensure that the water flowmeter is properly installed in accordance with the specifications adopted by the chief engineer by regulation;

(2) maintain the water flowmeter in satisfactory working condition whenever the diversion works can reasonably be expected to operate; and

(3) ensure that the water flowmeter measures all of the discharge from the diversion works and does not measure any other discharge, including tailwater and sewage lagoon effluent. (Authorized by and implementing K.S.A. 82a-1028, as amended by L. 2002, Ch. 137, § 5; effective May 1, 1979; amended Oct. 15, 1990; amended Jan. 10, 2003.)

5-22-4a. Water flowmeter requirement. Each nondomestic, nontemporary well meeting any of the following conditions shall be equipped with a water flowmeter that meets or exceeds the requirements of K.A.R. 5-22-4:

(a) A well operated under the authority of an approval of application issued on or after September 1, 1987;

(b) a well operated under the approval of an application for change in the place of use, the point of diversion, or the use made of the water, or any combination of these, filed after September 1, 1987;

(c) a well that meets the standards for being a standby well as set forth in K.A.R. 5-22-1;

(d) a well for which a certificate of appropriation was issued on or after July 1, 1995; or

(e) a well for which the board determines it is necessary to have a water flowmeter to ensure any of the following:

(1) The accuracy of reported water use;

(2) compliance with the terms, conditions, and limitations of the water right, approval of application, or approval of change; or

(3) nonimpairment of other water rights. (Authorized by and implementing K.S.A. 82a-1028, as amended by L. 2002, Ch. 137, § 5; effective Jan. 10, 2003.)

5-22-4b. Water flowmeter maintenance. (a) If a water flowmeter required by the district is ever out of compliance, the owner shall promptly repair or replace the water flowmeter, or correct any problems with the installation.

(b) A water flowmeter shall be considered to be out of compliance if any of the following conditions is met:

(1) The water flowmeter registers less than 94 percent or more than 106 percent of the actual volume of water passing the water flowmeter. If necessary, this determination may be made by a field test conducted or approved by the chief engineer.

(2) The seal placed on the totalizer by the manufacturer or the manufacturer's authorized representative has been broken, or the totalizer value has been reset or altered without the authoriza-

tion of the manufacturer, an authorized representative of the manufacturer, or the chief engineer.

(3) A seal placed on the water flowmeter or totalizer by the chief engineer has been broken.

(4) The water flowmeter register is not clearly visible or is unreadable for any reason.

(5) There is not full pipe flow through the water flowmeter.

(6) The flow-straightening vanes have not been properly designed, manufactured, and installed.

(7) The water flowmeter is not calibrated for the nominal size of the pipe in which the flowmeter is installed.

(8) The water flowmeter is not installed in accordance with the manufacturer's installation specifications. However, five diameters of straight pipe above the water flowmeter sensor and two diameters below the water flowmeter sensor shall be deemed the minimum required spacing, regardless of the manufacturer's installation specifications.

(9) A water flowmeter is installed at a location where the flowmeter does not measure all of the water diverted from the source of supply. (Authorized by and implementing K.S.A. 82a-706a and K.S.A. 2003 Supp. 82a-1028; effective Nov. 12, 2004.)

5-22-4c. Water flowmeter testing by a nondistrict person. If a water right owner desires to have a water flowmeter flow rate test performed by a person other than district staff to comply with any requirement of the district, that person may be approved by the board to perform a water flowmeter flow rate test if the person demonstrates to the district both of the following:

(a) The person has the training, skills, and experience necessary to properly conduct the test.

(b) The person has the appropriate water flowmeter to perform the test, and the water flowmeter has been tested for accuracy with water flowmeter test equipment that has been found to be accurate using standards traceable to the national institute of standards and technology (NIST). The equipment shall have been tested and found to be accurate within 12 months of performing the water flowmeter test. (Authorized by and implementing K.S.A. 82a-706a and K.S.A. 2003 Supp. 82a-1028; effective Nov. 12, 2004.)

5-22-4d. Water flowmeter installation procedures. (a) If installation of a water flowmeter is required by the board, the owner of the approval of application or the water right shall be notified of the requirement in writing.

(b) A water flowmeter shall be installed on a new or replacement point of diversion within 30 days after the point of diversion is operational, or before the diversion of water, whichever occurs first.

(c) A water flowmeter shall be installed on an existing point of diversion within 30 days of the issuance of the water flowmeter order by the district, or before the diversion of water, whichever occurs first.

(d) An extension of time to install the water flowmeter may be granted by the board if a request for an extension of time is filed with the district before the expiration of the time to install the water flowmeter and one of the following conditions is met:

(1) The water right owner has a contract with a vendor to install a water flowmeter, but the vendor cannot complete the installation within the time allowed.

(2) Weather, site conditions, or other conditions beyond the control of the owner prevent the water flowmeter from being installed within the time allowed.

(3) The owner demonstrates any other reason constituting good cause why the water flowmeter cannot be installed within the time allowed and that granting of an extension of time will not be adverse to the public interest.

(e) The water right owner shall notify the district within 30 days after the required water flowmeter is installed. The notification shall be submitted on a form prescribed by the district.

(f) An inspection of the water flowmeter installation may be made by the district to determine if the water flowmeter has been properly installed in accordance with the requirements of K.A.R. 5-22-4, K.A.R. 5-22-4a, and K.A.R. 5-22-4b.

(g) If an inspection is made by the district, the owner shall be notified by the district of the results of the inspection in writing. (Authorized by and implementing K.S.A. 82a-706a and K.S.A. 2003 Supp. 82a-1028; effective Nov. 12, 2004.)

5-22-5. (Authorized by K.S.A. 82a-1028(o); implementing K.S.A. 82a-1028(n); effective May 1, 1980; amended Oct. 15, 1990; revoked Jan. 10, 2003.)

5-22-6. Noncompliance; penalties; appeal procedures. (a) Any person may file with the board a written or verbal complaint that some-

one is allegedly violating any regulation of the district, any provision of the Kansas water appropriation act, or a term, condition, or limitation of an approval of application or a water right.

(b) The alleged violation shall be investigated by the district staff.

(c) A written report of the investigation shall be prepared by the district staff.

(d) If the investigation determines that a violation of a regulation of the district has occurred, an order shall be issued by the board or its designee. The order shall specify the following:

(1) What the violation of the regulation is;

(2) what actions are necessary to correct the violation;

(3) what a reasonable time is for correcting the violation. Extensions of time to correct a violation may be granted by the board if good cause is shown by the violator or owner;

(4) that the order will become effective immediately; and

(5) that a hearing may be requested within 15 days of the issuance of the order. The request for a hearing may include a request for a stay of the order. If the person shows good cause why a stay should be granted, a stay may be granted by the board.

(e) The owner or owners of the approval of application or water right, as shown in the records of the district, shall initially be notified of the violation verbally, in writing, or by other means. Regardless of the means of initial notification, a copy of the order shall also be served by delivering a copy of the order in person or by restricted mail.

(f) The record of the complaint, the investigation, and the notice of violation shall be made a part of the official records of the district.

(g) If the violation is corrected by the deadline specified by the board, the violator shall notify the district staff. An inspection shall be conducted by the district staff to determine if the violation has been corrected. If the violation has been corrected, the diversion of water may continue within the terms, conditions, and limitations of the approval of application or water right.

(h) If the violation is not corrected by the deadline specified by the board, an order requiring that unauthorized or illegal diversion of water cease until the violation is corrected shall be issued by the district.

(i) If the violator ceases diversion of water and then corrects the violation, the violator shall notify the district when the violation is corrected. The diversion works and the authorized place of use, as appropriate, shall be inspected by the district staff to determine whether the violation has been corrected. If the board determines that the violation has been corrected, the order prohibiting the diversion of water shall be rescinded by the board. When the owner or violator receives notice from the district that the order prohibiting the diversion of water has been rescinded, the diversion of water may recommence.

(j) If the violator performs any act described in subsection (a), any of the following actions may be taken by the board:

(1) If applicable, bring an injunctive action to enforce the order of the district;

(2) if applicable, request enforcement assistance from the chief engineer;

(3) if applicable, request that criminal proceedings be brought pursuant to K.S.A. 82a-728, and amendments thereto;

(4) if applicable, request that the county attorney or district attorney initiate injunctive remedies pursuant to K.S.A. 68-184, and amendments thereto, to prevent the occurrence of a nuisance;

(5) enter into a consent order with the violator specifying the remedial actions that shall be taken by the violator;

(6) require the installation of a water flowmeter;

(7) take any other legally permissible enforcement action; or

(8) any combination of the actions specified in paragraphs (j)(1) through (7).

(k) After the violator has been issued an order as specified in subsection (d), the violator, or anyone whose legal rights, duties, privileges, immunities, or other legal interests could be affected by the order, may appeal the order to the board. The appeal shall be filed within 15 days of the issuance of the order.

(l) The appeal petition shall state the basis for the appeal and shall be accompanied by documentation supporting the appeal.

(m) During the appeal, any relevant information or data may be considered by the board, including relevant data and information submitted by any person whose legal rights, duties, privileges, immunities, or other legal interests could be affected by the order.

(n) After consideration of the appeal, one of the following actions shall be taken by the board:

(1) Remand the matter to the district staff with instructions for additional investigation; or

(2) notify the violator and the chief engineer of

the board's final decision. The violator and all other parties shall be notified of the board's decision by certified mail.

(o)(1) Within 15 days after the service of the board's decision on the violator and any other affected party, the violator or any other affected party may file with the board a written request for reconsideration, which shall state the specific grounds for the request for reconsideration. The petition for reconsideration shall be deemed denied if not acted on by the board within 30 days.

(2) If the request for reconsideration is granted by the board, an administrative hearing shall be held by the board within 30 days of the date on which the request is filed with the board. After the hearing, the board may affirm, reverse all or part of, or modify the order of the board. (Authorized by and implementing K.S.A. 82a-706a and K.S.A. 2003 Supp. 82a-1028; effective May 1, 1980; amended Dec. 10, 2004.)

5-22-7. Safe yield. (a) Except as set forth in subsection (b), the approval of each application for a change in the point of diversion, term permit, and permit to appropriate water for beneficial use shall be subject to the following requirements:

(1) The sum of prior appropriations, including the proposed application, vested rights, appropriation rights, term permits and earlier priority applications and baseflow nodes, shall not exceed the allowable safe-yield amount for the area of consideration. The non-consumptive use of groundwater previously authorized by the chief engineer shall be excluded from the sum of prior appropriations.

(2) The quantity authorized on all prior permits, certificates, and vested rights, the quantity requested on prior applications, and the quantities allocated to baseflow nodes shall be used to calculate the sum of prior appropriations and baseflow allocations.

(3) All conditions and limitation clauses listed on all prior appropriations and applications in the area of consideration shall be considered in effect.

(4) The baseflow allocation for baseflow nodes shall be calculated using the formula $Qa = T/N$ where:

(A) Qa is the baseflow allocation per baseflow node in acre-feet per year;

(B) T is the total baseflow allocation for a reach of a stream in acre-feet per calendar year. T is the average of the 12 calendar months' daily flow values in cubic feet per second that were equaled or exceeded 90 percent of the time during a specifically designated hydrologically significant period of record, times a factor of 724; and

(C) N is the number of baseflow nodes established on a stream or reach of a stream. Nodes are located at the upstream end of the watercourse reach and thereafter at the intersection of the channel of a watercourse and an arc of a 1,320 foot-radius circle whose center is located on the previously established baseflow node.

(5) The allowable safe-yield amount shall be calculated using the formula $S = A \times K$ where:

(A) S is the allowable safe-yield amount in acre-feet per year;

(B) A is the area of consideration; and

(C) K is an aquifer recharge value in feet. Everywhere in the district, except in McPherson county, K is equal to 0.5 feet per year. In McPherson county, K is a constant equaling 0.25 feet per year. K is calculated by multiplying the recharge percentage, which is 10 percent in McPherson county and 20 percent for the rest of the district, times the average annual precipitation of 2.5 feet per year.

(6) When evaluating an application for a change in the point of diversion, each application with a priority earlier than the priority established by the filing of the application of change shall be included in the safe-yield analysis.

(7) If the perimeter of the area under consideration intersects a group of wells authorized under prior applications, permits, certificates, or vested rights, a reasonable quantity of water shall be assigned to each well based upon the best available information.

(b) The following shall not be subject to this regulation:

(1) An application to appropriate groundwater in an area not closed by regulation or intensive groundwater use control area order by the chief engineer to new non-domestic, non-temporary permits and term permits for five or fewer years, if all of the following conditions are met:

(A) The annual quantity of water requested in the application does not exceed 15 acre-feet;

(B) the sum of the annual quantity of water requested in the application and the total annual quantities of water authorized by prior approvals of applications allowed because of an exemption pursuant to this regulation does not exceed 45 acre-feet in a two-mile-radius circle surrounding the proposed point of diversion;

(C) the approval of the application does not au-

thorize an additional quantity of water out of an existing authorized point of diversion with a non-domestic approval of application or water right that would then authorize a total combined annual quantity of water from that point of diversion in excess of 15 acre-feet;

(D) the application complies with the well spacing criteria in K.A.R. 5-22-2; and

(E) the application complies with all other applicable regulations in effect when the application is filed;

(2) an application for a non-consumptive use of groundwater;

(3) an application for change in point of diversion, if the diversion works were completed:

(A) 300 feet or less from the originally authorized point of diversion;

(B) within 150 feet of the location approved by the chief engineer; and

(C) a notice of completion was timely filed with the chief engineer under the original approval of application;

(4) an application requesting only an additional rate of diversion on an existing well, if the approval of the application:

(A) Is limited to the maximum annual quantity of water authorized by a prior certified, vested, or appropriation right; and

(B) contains both of the following conditions:

(i) The approved application for additional rate shall be dismissed if the prior certified, vested, or appropriation right is dismissed and terminated; and

(ii) the approved or certified maximum annual quantity of water shall be reduced in an amount equal to any subsequent reduction in the maximum annual quantity of water authorized by the prior certified, vested, or appropriation right;

(5) an application for a standby well;

(6) an application for a bank storage well only to the extent that the bank storage well is withdrawing bank storage water; and

(7) an application for an aquifer storage and recovery well. (Authorized by and implementing K.S.A. 82a-706a and K.S.A. 2003 Supp. 82a-1028; effective May 1, 1983; amended Oct. 15, 1990; amended March 7, 1994; amended Nov. 12, 2004.)

5-22-8. Change applications. (a) Except as set forth in subsection (d), the approval of each application for a change in point of diversion for a vested right, appropriation right, permit, term permit, or an application to appropriate groundwater shall be subject to the following requirements:

(1) The maximum distance a replacement well can be located from the originally authorized location shall be 2,640 feet.

(2) A replacement well located more than 300 feet from the currently authorized location shall comply with the provisions of K.A.R. 5-22-2.

(3) An application for a change in point of diversion shall be accompanied by either a completed abandoned-well or inactive-well agreement if the original well will no longer be authorized by any other vested right, appropriation right, approval of application, or term permit and the well has not been properly physically adapted for, and actually used for, domestic use. The completed agreement shall be submitted by the applicant with the application for a change in point of diversion on a form prescribed by the district.

(4) Each point of diversion described in the application shall be equipped with a water flowmeter that meets or exceeds the criteria of K.A.R. 5-22-4, K.A.R. 5-22-4a, K.A.R. 5-22-4b, and K.A.R. 5-22-4d.

(b) The approval of each application for a change in place of use or the use made of water for a vested right, appropriation right, approval of application, and term permit shall have a condition that a water flowmeter that meets or exceeds the requirements of K.A.R. 5-22-4, K.A.R. 5-22-4a, K.A.R. 5-22-4b, and K.A.R. 5-22-4d be installed on each point of diversion described in the application.

(c) Except as specified in subsection (d), each approval of application for a change in place of use for irrigation purposes shall be subject to the following requirements:

(1) If the time to perfect the water right has expired, the water right shall be certified before the change application may be approved.

(2) The approval of the application for change in place of use shall not authorize an increase in the size of the authorized place of use in excess of the limits specified in K.A.R. 5-5-11(b).

(d) An application for change in place of use for irrigation purposes filed only for the purpose of creating an identical place of use with another water right or rights shall not be subject to subsection (c) if all of the following conditions are met:

(1) There is not a net increase in the number of authorized acres.

(2) Each water right involved in the proposed

identical overlap in place of use is certified by the chief engineer before processing the change application if approval of the change application would authorize an increase in base acreage as defined in K.A.R. 5-5-11(a).

(3) The total quantity authorized by all existing water rights and all permits involved is reasonable to irrigate the land authorized after the change in place of use is approved. (Authorized by and implementing K.S.A. 82a-706a and K.S.A. 2003 Supp. 82a-1028; effective Oct. 15, 1990; amended March 7, 1994; amended Nov. 12, 2004.)

5-22-9. Exceptions. Each recommendation timely submitted by the district concerning an exemption from, or waiver to, a regulation adopted by the chief engineer shall be considered by the chief engineer. An exception to these regulations may be granted by the chief engineer if the applicant demonstrates that the exception will neither impair a use under an existing right nor prejudicially affect the public interest. (Authorized by K.S.A. 82a-706a and K.S.A. 2003 Supp. 82a-1028; implementing K.S.A. 82a-706a and K.S.A. 2003 Supp. 82a-1028; effective Oct. 15, 1990; amended Nov. 12, 2004.)

5-22-10. Aquifer storage and recovery system: data reporting requirements. (a) Each person operating an aquifer storage and recovery system of which all or part of is within the boundaries of the district shall file an annual report with the district no later than June 1 for the previous calendar year. The report shall contain the water balance in the basin storage area and, in addition to the information required by K.A.R. 5-12-2, information about the following, as specified:

(1) Source water:

(A) The type;

(B) the quantity of water available;

(C) the quantity of water surface water and bank storage water diverted;

(D) the basin storage loss; and

(E) the chemical, physical, radiological, and biological quality for each type of source water diverted;

(2) aquifer storage:

(A) The artificial recharge techniques used;

(B) the quantity of source water recharged by each technique used;

(C) the total quantity of source water stored in the basin storage area; and

(D) the chemical, physical, radiological, and biological quality for each type of water stored;

(3) recovery of stored water:

(A) A monthly and annual summary of recharge credits withdrawn from each recovery well; and

(B) the chemical, physical, radiological, and biological quality of the water recovered; and

(4) hydrologic conditions:

(A) The quarterly index water levels;

(B) the key groundwater quality parameters;

(C) the monthly and annual precipitation quantities;

(D) the annual groundwater withdrawals from all wells except domestic wells;

(E) the annual streamflow, including baseflows and above-baseflow stage;

(F) a summary of the conjunctive use amounts; and

(G) the water supply and demand forecast for the next three years.

(b) The operator of the aquifer storage and recovery system shall furnish the district with whatever analyses, data, and other supporting documentation are necessary to understand and verify the report.

(c) The board shall review the report and submit its findings and recommendations to the chief engineer regarding the report no later than September 1 of the calendar year in which the report is required to be filed. (Authorized by and implementing K.S.A. 82a-706a and K.S.A. 2003 Supp. 82a-1028; effective Dec. 10, 2004.)

5-22-12. Application processing requirements and procedures. (a) Except as provided in subsection (c), each application for any of the following shall be subject to the requirements and procedures in subsection (b):

(1) Appropriate water for beneficial use;

(2) change the point of diversion, the use made of water, the place of use, or any combination of these; or

(3) obtain a term permit.

(b)(1) Before final action is taken on an application, a copy of the application shall be submitted by the chief engineer to the district for review and recommendation.

(2) The district staff shall conduct a review of the proposed application. The district staff's recommendation to the chief engineer shall be consistent with the provisions of the Kansas water appropriation act, the groundwater management district act, and the regulations adopted by the chief engineer pursuant to those acts.

(3) Within 15 working days after the date the

chief engineer submits the application to the district for review, or any extension of time approved by the chief engineer, the district staff shall submit to the chief engineer its findings and recommendation for approval, denial, or modification of the application and shall specify the basis for the recommendation. At the same time the district submits its recommendation to the chief engineer, the recommendation shall also be served on the applicant and any other parties to the proceedings.

(4) A district staff's findings and recommendation concerning an application may be appealed to the board by the applicant or anyone whose legal rights, duties, privileges, immunities, or other legal interests may be affected by approval, denial, or modification of the application.

(5) The petition for review by the board shall be filed by the party appealing the recommendation with the board within 30 days after the date of the letter sending the findings and recommendations by the staff of the district to the applicant or other party. The petition shall state the basis for the appeal and shall be accompanied by documentation supporting the appeal.

(6) During the appeal, any relevant information or data may be considered by the board, including relevant data and information submitted by a person whose legal rights, duties, privileges, immunities, or other legal interests may be affected by approval, denial, or modification of the application.

(7) After consideration of the appeal, one of the following actions shall be taken by the board:

(A) Remanding the matter to the district staff with instructions for additional investigation; or

(B) notifying the applicant and the chief engineer of the board's final recommendation. The applicant and all other parties shall be notified of the board's decision by certified mail.

(8) Within 15 days after the service of the board's decision on the applicant and any other party, the applicant or any other party may file with the board a written request for reconsideration, which shall state the specific grounds for the request for reconsideration. The petition for reconsideration shall be deemed denied if not acted on by the board within 30 days.

(c) The following shall not be subject to this regulation:

(1) The domestic use of water;

(2) an application for a temporary permit; and

(3) an application to change the point of diversion if both of the following conditions are met:

(A) The point of diversion is proposed to be moved less than 300 feet; and

(B) the point of diversion is not a battery. (Authorized by and implementing K.S.A. 82a-1028, as amended by L. 2002, Ch. 137, § 5; effective Jan. 10, 2003.)

5-22-13. Potential net evaporation. (a) The map titled "annual potential net evaporation in inches for Equus Beds groundwater management district no. 2 (annual average evaporation minus annual normal precipitation)," prepared by the district and dated June 11, 2002, is hereby adopted by reference for the purpose of determining potential net evaporation from a free-water surface within the district.

(b) The values on the map shall be used in all situations in which the determination of potential net evaporation from a free-water surface is necessary, including the following:

(1) Computing the annual amount of evaporation that will be caused by exposing the groundwater table;

(2) calculating the quantity of surface water that is reasonably expected to be replaced with groundwater pumped under an approval of application or water right;

(3) calculating the average annual evaporation from groundwater that will be used to determine annual water use; and

(4) determining the maximum annual quantity of water that is perfected pursuant to K.S.A. 82a-714, and amendments thereto.

(c) The values shown on the map shall be used unless the applicant provides, or the chief engineer or the district has available, better or more site-specific data concerning potential net evaporation. (Authorized by and implementing K.S.A. 82a-706a and K.S.A. 2003 Supp. 82a-1028; effective Dec. 10, 2004.)

5-22-14. Maximum reasonable quantity for beneficial use. (a) The maximum annual quantity of water deemed reasonable for irrigation use shall be the following:

(1) 1.3 acre-feet per acre in Harvey, McPherson, and Sedgwick counties; and

(2) 1.4 acre-feet per acre in Reno county.

(b) The following quantities shall be used to determine the maximum annual quantity of water deemed reasonable for nondomestic livestock and poultry use:

Livestock or poultry	Drinking water (gallons per day)	Units
Cattle, beef	15	per head
Cattle, dairy	35	per head
Swine finishing nursery sow and litter gestating sow	 5 1 8 6	per head
Sheep	2	per head
Horses	12	per head
Poultry chickens turkeys	 9 30	 100 layers 100 turkeys
Calves (750 pounds or less)	10	per head
Goats	9	per head

(c) The maximum reasonable quantity of water that may be approved for nondomestic livestock and poultry use for applications approved on or after the effective date of this regulation shall be limited as specified in subsection (b), unless the applicant demonstrates with adequate supporting information that the quantity of water and rate of diversion requested meet the following conditions:

(1) Are reasonable for the intended use;

(2) are not wasteful; and

(3) will not otherwise prejudicially and unreasonably affect the public interest.

(d) For all other types of nondomestic livestock, poultry, birds, and animals, the maximum quantity of water approved for beneficial use shall be reasonable. The applicant shall justify the quantity of water requested with information on peer water use, the historical measured usage, a professional recommendation, or any other relevant information.

(e) Each applicant who seeks to appropriate water for industrial use shall submit information to demonstrate that the annual quantity of water requested is reasonable for that particular type of industrial use. The information submitted shall include the quantity of water reasonable for that type of industrial use based on current industry standards and a use of technology that is economically and technically feasible for that industry at that location.

(f) Unless the applicant demonstrates a projected deviation from actual population trends, a reasonable annual quantity of water for municipal use shall not exceed the lessor of either of the following:

(1) 200 gallons per capita per day; or

(2) 110 percent of the last three years' average per capita per day usage, excluding industries that use over 200,000 gallons per year, times 365 days per year, times the projected population for the twentieth year after the application is filed, plus reasonable projected water use for industries that use over 200,000 gallons per year. Population projections shall be made using one of the following:

(A) Accepted statistical methods using historic population trends for the applicant; or

(B) data from the U.S. census bureau, Kansas water office population projections, or the Kansas census bureau. Projected deviations from historic population trends shall be justified by the applicant.

(g) The maximum annual quantity of water deemed reasonable to be provided from a well to a pond, lake, or reservoir that does not expose the current or historical water table shall be calculated using the formula $Q_c = [(E+S)/12] \times A_{sw} + F$ where:

(1) Q_c is the maximum quantity of water use in acre-feet;

(2) E is the potential net evaporation in inches per year;

(3) S is the seepage loss based on soil and subsoil in inches per year;

(4) A_{sw} is the surface area of the pond in acres as measured at the elevation of the lowest uncontrolled spillway; and

(5) F is the quantity of water in acre-feet necessary to fill the pond initially.

(h) The maximum annual quantity of water deemed reasonable to replace the evaporation from a groundwater pit shall be calculated using the formula $Q_c = (E/12) \times A_{wt}$ where:

(1) Q_c is the maximum annual quantity of evaporation of groundwater from the pit in acre-feet;

(2) E is the potential net evaporation in inches per year; and

(3) A_{wt} is the area of the water table exposed in the groundwater pit expressed in acres. (Authorized by and implementing K.S.A. 82a-706a and K.S.A. 2003 Supp. 82a-1028; effective Dec. 10, 2004.)

5-22-15. Limitations on the use of fresh groundwater. (a) Fresh groundwater shall not be used for any of the following purposes, unless the

applicant demonstrates before approval of the application that the use of other waters is not technologically or economically feasible:

(1) The enhanced recovery of oil or gas;

(2) solution mining;

(3) the construction of storage caverns in subsurface salt deposits;

(4) the displacement and extraction of hydrocarbons from subsurface storage;

(5) any use that is not a beneficial use, as defined in K.A.R. 5-1-1; and

(6) any use that is not in the public interest.

(b) "Other waters" shall include the following:

(1) Water having a chloride content of more than 500 milligrams per liter (mg/l);

(2) water that is otherwise contaminated so that it is not drinkable;

(3) renewable surface water; and

(4) water that is being reclaimed, recycled, or reused. (Authorized by K.S.A. 82a-706a and K.S.A. 2003 Supp. 82a-1028; implementing K.S.A. 82a-706a, K.S.A. 2003 Supp. 82a-711, and K.S.A. 2003 Supp. 82a-1028; effective Dec. 10, 2004.)

5-22-17. Bank storage wells. (a) Each applicant for one or more bank storage wells shall demonstrate all of the following:

(1) The hydraulic connection from the streambed and banks to each bank storage well screen is sufficient to transmit bank storage water from the bed and banks of the stream to each bank storage well screen at a rate sufficient to sustain the authorized rate of diversion of the well or wells.

(2) Within seven days after the pumping of all bank storage wells has ceased, the water level in each bank storage well, or a monitoring well located within 100 feet of that bank storage well, will recover to an elevation equal to or greater than the water level elevation immediately before the bank storage well began to pump, adjusted for any regional groundwater level changes not caused by the pumping of the bank storage well.

(3) The naturally occurring and artificially induced rate of infiltration from the bed and banks of the stream when bank storage is occurring will be sufficient to meet the following conditions:

(A) Equal or exceed the authorized rate of diversion of all of the bank storage wells;

(B) prevent impairment caused by all bank storage wells; and

(C) prevent groundwater mining caused by all bank storage wells.

(b) If an application for a bank storage well is approved by the chief engineer, the applicant shall install one or more water-level measurement tubes at locations that will allow adequate monitoring of groundwater quality and groundwater levels within the area where the annual cone of depression of the bank storage well or wells could be greater than 0.5 feet. Each water-level measurement tube shall be constructed and maintained in accordance with K.A.R. 5-6-13. (Authorized by K.S.A. 82a-706a and K.S.A. 2003 Supp. 82a-1028; implementing K.S.A. 82a-706a and K.S.A. 2003 Supp. 82a-1028; effective Nov. 12, 2004.)

Article 23.—SOUTHWEST KANSAS GROUNDWATER MANAGEMENT DISTRICT NO. 3

5-23-1. Definitions. As used in these regulations, by the southwest Kansas groundwater management district in the implementation of the groundwater management district act, and by the division of water resources in the administration of the Kansas water appropriation act and the groundwater management district act, unless the context clearly requires otherwise, the following words and phrases shall have the meanings ascribed to them in this regulation. (a) "Confined aquifer" means an aquifer overlain and underlain by impermeable layers. Groundwater in a confined aquifer is normally under pressure greater than atmospheric pressure.

(b) "High plains aquifer" means the aquifer comprised of the undifferentiated Pleistocene-age deposits, Quaternary loess, alluvium, dune sand, the Ogallala formation, and deeper aquifers that are in vertical or horizontal hydraulic contact with the Ogallala formation.

(c) "Hydraulic contact" means the absence of an impermeable layer between aquifers.

(d) "Theis analysis" means the Theis non-equilibrium equation analysis described in pp. 108-113 in "ground water and wells: a reference book for the water-well industry," published in 1966 by Edward E. Johnson, Inc. The pages specified in this subsection are hereby adopted by reference.

(e) "Unconfined aquifer" means an aquifer in which the groundwater is exposed to the atmosphere through openings in the overlying materials. The upper surface of an unconfined aquifer is the water table.

(f) "Well" means any artificial excavation that is

drilled, cored, bored, washed, driven, dug, or otherwise constructed when the intended use of the excavation is for the acquisition, diversion, or artificial recharge of groundwater. (Authorized by K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-1028(o); implementing K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-1028; effective May 1, 1981; amended May 1, 1985; amended Sept. 22, 2000; amended Feb. 27, 2004.)

5-23-2. Tailwater control and waste. No water user shall allow waste of water. If the water is re-used, the user shall apply the water consistent with the approved application to appropriate water for beneficial use, vested right or appropriation right. All water users shall construct and operate the water distribution systems in a manner as to prevent the waste of water, and shall do everything necessary and proper to preserve the quality of the groundwater resources within the district. (Authorized by K.S.A. 1980 Supp. 82a-1028(o); implementing K.S.A. 1980 Supp. 82a-1028(n); effective May 1, 1981.)

5-23-3. Minimum well spacing requirements: high plains aquifer. (a) (1) The minimum horizontal distance between each proposed nontemporary, nondomestic well and all other senior nontemporary, nondomestic wells diverting water from the high plains aquifer shall be determined from the following schedule.

Quantity per well (acre-feet per year)	Minimum well spacing requirement
15 or less	660 feet
16 - 200	1,300 feet
201 - 300	1,600 feet
301 - 400	1,900 feet
401 - 500	2,100 feet
more than 500	2,300 feet

(2) The minimum well spacing requirement shall be based on the maximum annual quantity of water. The required well spacing shall be the greater of either of the following:

(A) The minimum spacing for the total authorized and requested quantity of water for the proposed well; or

(B) the total authorized and requested annual quantity of water for the nontemporary, nondomestic well against which the spacing is being measured that is senior to the date on which the application was filed. If the quantity of water applied for includes a fraction of an acre-foot, the quantity of water shall be rounded down to the next whole number of acre-feet for the purpose of applying the table in this subsection.

(b) The location of a well or wells on an application for approval to change the point of diversion under an existing water right shall be no more than 2,640 feet from the currently authorized and completed point of diversion.

(c) A well shall be exempt from the minimum well spacing requirements of this regulation if the well meets either of the following conditions:

(1) The well is being replaced within 300 feet of the currently authorized point of diversion.

(2) The proposed replacement well location improves the spacing to all other wells for which the spacing requirement was not met on the date on which the application for a change in point of diversion was filed and continues to meet requirements for spacing to all wells for which the spacing requirement was met at the time the application for change in point of diversion was filed.

(d) No application for approval to change the point of diversion under an approved application for which the original well has not been drilled shall be approved if the location of the proposed point of diversion decreases the distance from the approved location to any other existing wells to less than the spacing requirement for new applications.

(e) Each nondomestic, nontemporary well shall be located a minimum of 660 feet from all domestic wells with a priority earlier than the date on which the change application was filed, unless all of the following conditions are met:

(1) The domestic well is owned by the applicant.

(2) The applicant signs a written request to waive the requirements for spacing to the domestic well.

(3) The applicant submits information documenting the location and depth of the domestic well and any other information necessary for the chief engineer to determine whether the domestic well is likely to be impaired.

(4) A Theis analysis or other hydraulic analysis shows that the domestic well is not likely to be impaired by the proposed well.

(f) In the case of a battery of wells, as defined in K.A.R. 5-1-1, the minimum horizontal distance shall be measured from the geographic center of the wells comprising the battery.

(g) The total annual quantity per well shall be the sum of all of the quantities authorized or requested by any water rights, permits, or applica-

tions requesting or authorizing that well as a point of diversion. (Authorized by K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-1028; implementing K.S.A. 82a-706a, K.S.A. 2002 Supp. 82a-711, K.S.A. 2002 Supp. 82a-708b, and K.S.A. 82a-1028; effective May 1, 1981; amended May 1, 1985; amended Aug. 28, 1989; amended Sept. 30, 1991; amended Sept. 22, 2000; amended Feb. 27, 2004.)

5-23-3a. Minimum well spacing requirements: confined aquifers. (a)(1) The minimum horizontal distance between each proposed nontemporary, nondomestic well and all other senior nontemporary, nondomestic wells diverting water from a confined aquifer shall be determined from the following schedule.

Quantity per well (acre-feet per year)	Minimum well spacing requirement	Required distance from hydraulic contact point
15 or less	660 feet	2,640 feet
16 to 25	2,300 feet	1 mile
26 to 100	5,280 feet	2 miles
More than 100	10,560 feet	5 miles

(2) The minimum well spacing requirement shall be based on the authorized maximum annual quantity of water. The well spacing requirement shall be the greater of either of the following:

(A) The minimum spacing for the total authorized and requested annual quantity of water of the proposed well; or

(B) the total authorized and requested quantity of water for nontemporary, nondomestic well against which spacing is being measured that is senior to the date on which the application was filed.

The total annual quantity of water per well shall be the sum of all of the quantities authorized or requested by any water rights, approvals of applications, or applications requesting or authorizing that well as a point of diversion.

If the quantity of water applied for includes a fraction of an acre-foot, the quantity of water shall be rounded down to the next whole number of acre-feet for the purpose of applying the table in this subsection.

(b) In the case of a battery of wells, as defined in K.A.R. 5-1-1, the minimum horizontal distance shall be measured from the geographic center of the wells comprising the battery.

(c) A well penetrating both a confined and unconfined aquifer shall be constructed to prevent the vertical migration of water between the aquifers. A well diverting water from the Dakota aquifer system shall be constructed to prevent the vertical migration of water between the Dakota aquifer system and all other freshwater aquifers.

(d) The location of a well or wells on an application for approval to change the point of diversion under an existing water right shall be no more than 2,640 feet from the currently authorized and completed point of diversion.

(e) A well shall be exempt from the minimum well spacing requirements of this regulation if the well meets either of the following conditions:

(1) The well is being replaced within 300 feet of the currently authorized point of diversion.

(2) The proposed replacement well location improves the spacing to all other wells for which the spacing requirement was not met on the date on which the application for a change in point of diversion was filed and continues to meet requirements for spacing to all wells for which the spacing requirement was met at the time the application for change in point of diversion was filed.

(f) No application for approval to change the point of diversion under an approval of application for which the original well has not been drilled shall be approved if the location of the proposed point of diversion decreases the distance from the approved location to any other existing wells to less than the spacing requirements for a new application.

(g) Each nondomestic, nontemporary well shall be located a minimum of 1,320 feet from all domestic wells in the same or a hydraulically connected aquifer with a priority earlier than the date on which the change application was filed, unless all of the following conditions are met:

(1) The domestic well is owned by the applicant.

(2) The applicant signs a written request to waive the requirements for spacing to the domestic well.

(3) The applicant submits information documenting the location and depth of the domestic well and any other information necessary for the chief engineer to determine whether the domestic well is likely to be impaired.

(4) A Theis analysis or other hydraulic analysis shows that the domestic well is not likely to be impaired by the proposed well.

(h) The minimum horizontal distance between a nontemporary, nondomestic well withdrawing water from a confined aquifer and a well withdrawing water from an unconfined aquifer shall

be 660 feet. (Authorized by K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-1028; implementing K.S.A. 82a-706a, K.S.A. 2002 Supp. 82a-711, K.S.A. 2002 Supp. 82a-708b, and K.S.A. 2002 Supp. 82a-1028; effective Sept. 22, 2000; amended Feb. 27, 2004.)

5-23-4. Safe yield: high plains aquifer. (a) Except as set forth in subsection (b), the approval of all applications for a permit to appropriate water from the high plains aquifer, and the approval of all applications for a change in the point of diversion if the diversion works have not been completed under the original approved application, shall be processed in accordance with K.A.R. 5-3-9, K.A.R. 5-3-10, and K.A.R. 5-3-11. For the purpose of applying K.A.R. 5-3-11 (d)(3) within the boundaries of the district, the percentages of the calculated recharge that shall be considered to be available for appropriation shall be determined using the following table:

Percent of Calculated Recharge Available for Appropriation	River Basin
(A) 75 %	Arkansas
(B) 75 %	Cimarron River
(C) 75 %	Crooked Creek
(D) 75 %	North Fork Cimaron River

(b) This regulation shall not apply to the following:

(1) Wells for domestic use;

(2) wells authorized by temporary permits;

(3) wells authorized by term permits of fewer than five years;

(4) an application to appropriate 15 acre-feet of water or less if all of the following conditions are met:

(A) The safe yield has been exceeded, but the sum of the annual quantity requested by the proposed appropriation and the total quantities authorized by prior permits because of this exemption does not exceed 15 acre-feet in a circle with a radius of ½ mile surrounding the proposed point of diversion.

(B) Well spacing criteria have been met.

(C) Approval of the application will not authorize an additional quantity of water out of an existing well authorized by a nondomestic approval of application or water right, which would result in a total combined annual quantity of water authorized from that well in excess of 15 acre-feet.

(D) All other criteria for processing a new application have been met.

(c) Each application filed to request a well within the area described in subsection (e) shall include a driller's log, an electric log, and a laboratory analysis from a state-certified laboratory of the chloride concentrations in samples taken from whatever depths are necessary to determine the vertical location where the chloride concentrations exceed 250 milligrams per liter (mg/l). The samples shall be taken from a well located within a 300-foot radius of the proposed well. A state-certified laboratory analysis shall be used to determine the vertical location of the chloride concentrations exceeding 250 mg/l.

(d) Each well constructed in the area described in subsection (e) shall be constructed in a manner that prevents the movement of water containing 250 mg/l of chlorides beyond its naturally occurring condition.

(e) The level of chlorides may exceed 250 mg/l in the following areas:

(1) The west ½ of townships 33, 34, and 35 south, range 28 west in Meade County, Kansas;

(2) the east ½ of township 33 south, range 29 west in Meade County, Kansas;

(3) all of townships 34 and 35 south, ranges 29 and 30 west in Meade County, Kansas; and

(4) all of townships 34 and 35 south, ranges 31 and 32 west and the east ½ of townships 34 and 35 south, range 33 west in Seward County, Kansas. (Authorized by K.S.A. 82a-706a and 82a-1028; implementing K.S.A. 82a-706a, K.S.A. 2002 Supp. 82a-711, and K.S.A. 2002 Supp. 82a-1028; effective May 1, 1981; amended May 1, 1986; amended Aug. 28, 1989; amended Sept. 22, 2000; amended Nov. 21, 2003.)

5-23-4a. Criteria for closing townships to new appropriations. (a) Entire townships shall be closed to further appropriation of water for beneficial use from the high plains aquifer if at least one of the following conditions exists:

(1) The entire township is fully appropriated.

(A) A township shall be considered to be fully appropriated if the aquifer within the township would be depleted by 40 percent or more in 25 years if current vested rights and appropriations are fully exercised and all limitation clauses listed on permits to appropriate water and certificates are in force.

(B) Aquifer depletion shall be calculated using the allowable annual appropriation formula de-

scribed in subsection (b) with the area of consideration equal to the number of acres within sections of land containing saturated thickness within the township.

(2) The average saturated thickness of the aquifer within the township is 50 feet or less, as set forth in K.A.R. 5-23-15.

(3) The aquifer has been depleted by 20 percent or more since 1950. Depletion since 1950 shall be determined from maps or data, or both, recommended by the board and adopted by the chief engineer by regulation.

(4) Groundwater pumping has lowered the water level of the high plains aquifer, which has diminished the baseflow from the aquifer to the stream and impaired senior domestic surface water rights and other senior surface water rights.

(5) Groundwater pumping in an area has lowered the water level of the freshwater to the point that the issuance of additional approvals of applications will induce water in excess of 250 milligrams per liter chlorides to mix with overlying freshwater, causing contamination of the overlying freshwater.

(b) Except for the types of wells listed in subsection (c), the proposed appropriation, when added to the vested rights, prior appropriation rights, and earlier priority applications, shall not exceed, in 25 years, a calculated rate of depletion of 40 percent of the saturated thickness underlying the area of consideration. For the purpose of analysis, all vested rights, appropriation rights, approvals of applications, and prior unapproved applications shall be considered to be fully exercised, and all limitation clauses on approvals of application and certificates shall be considered to be in force. The allowable annual appropriation shall be calculated using the following formula:

$$\text{Allowable Aquifer Yield} = \frac{0.40AMS}{25} + \frac{AR}{12}$$

Allowable aquifer yield = the amount of water, measured in acre-feet, available annually for appropriation from a proposed point of diversion (well).

A = the "area of consideration" shall be equal to the number of acres within sections containing saturated thickness within the township and within the district.

M = the number of feet of average saturated thickness of the high plains aquifer within the township as set forth in K.A.R. 5-23-15.

S = the storage coefficient or a specific yield of 15 percent.

R = average annual recharge and return flow, which shall be one inch per year.

(c) The calculation specified in subsection (b) shall not include the following types of wells:

(1) Wells for domestic use;

(2) wells authorized by temporary permits; and

(3) wells authorized by term permits of fewer than five years. (Authorized by K.S.A. 82a-706a and 82a-1028(o); implementing K.S.A. 82a-1028(n); effective Sept. 30, 1991; amended Sept. 22, 2000; amended Nov. 21, 2003.)

5-23-4b. Township closures. (a) The following townships have been determined to meet the criteria in K.A.R. 5-23-4a for closing a township to new appropriations of water from the high plains aquifer; therefore, no new appropriations of water shall be allowed from the high plains aquifer in the following townships, except as described in subsection (b):

County	Township	Range	County	Township	Range
Finney	21	30	Ford	26	21
Finney	21	31	Ford	26	22
Finney	21	32	Ford	26	23
Finney	21	33	Ford	26	24
Finney	21	34	Ford	26	25
Finney	22	30	Ford	26	26
Finney	22	31	Ford	27	21
Finney	22	32	Ford	27	22
Finney	22	33	Ford	27	23
Finney	22	34	Ford	27	24
Finney	23	27	Ford	27	25
Finney	23	28	Ford	27	26
Finney	23	29	Ford	28	21
Finney	23	30	Ford	28	22
Finney	23	31	Ford	28	23
Finney	23	32	Ford	28	24
Finney	23	33	Ford	28	25
Finney	23	34	Ford	28	26
Finney	24	31	Ford	29	21
Finney	24	32	Ford	29	22
Finney	24	33	Ford	29	23
Finney	24	34	Ford	29	24
Finney	25	31	Ford	29	25
Finney	25	32	Ford	29	26
Finney	25	33	Grant	27	35
Finney	25	34	Grant	27	36
Finney	26	31	Grant	27	37
Finney	26	32	Grant	27	38
Finney	26	33	Grant	28	35
Finney	26	34	Grant	28	36
Ford	25	21	Grant	28	37
Ford	25	22	Grant	28	38
Ford	25	23	Grant	29	35
Ford	25	24	Grant	29	36
Ford	25	25	Grant	29	37
Ford	25	26	Grant	29	38

County	Township	Range
Grant	30	35
Grant	30	36
Grant	30	37
Grant	30	38
Gray	24	27
Gray	24	28
Gray	24	29
Gray	24	30
Gray	25	27
Gray	25	28
Gray	25	29
Gray	25	30
Gray	26	27
Gray	26	28
Gray	26	29
Gray	26	30
Gray	27	27
Gray	27	28
Gray	27	29
Gray	27	30
Gray	28	27
Gray	28	28
Gray	28	29
Gray	28	30
Gray	29	27
Gray	29	28
Gray	29	29
Gray	29	30
Hamilton	25	42
Hamilton	25	43
Hamilton	26	39
Hamilton	26	40
Hamilton	26	41
Hamilton	26	42
Hamilton	26	43
Haskell	27	31
Haskell	27	32
Haskell	27	33
Haskell	27	34
Haskell	28	31
Haskell	28	32
Haskell	28	33
Haskell	28	34
Haskell	29	31
Haskell	29	32
Haskell	29	33
Haskell	29	34
Haskell	30	31
Haskell	30	32
Haskell	30	33
Haskell	30	34
Kearny	22	35
Kearny	22	36
Kearny	22	37
Kearny	22	38
Kearny	23	35
Kearny	23	36
Kearny	23	37
Kearny	23	38
Kearny	24	35
Kearny	24	36
Kearny	24	37
Kearny	24	38
Kearny	25	35
Kearny	25	36
Kearny	25	37
Kearny	25	38
Kearny	26	35
Kearny	26	36
Kearny	26	37
Kearny	26	38
Meade	30	26
Meade	30	27
Meade	30	28
Meade	30	29
Meade	30	30
Meade	31	26
Meade	31	27
Meade	31	28
Meade	31	29
Meade	31	30
Meade	32	28
Meade	32	29
Meade	32	30
Meade	33	28
Meade	33	29
Meade	33	30
Meade	34	28
Meade	34	29
Meade	34	30
Meade	35	28
Meade	35	29
Meade	35	30
Morton	31	39
Morton	31	40
Morton	31	41
Morton	31	42
Morton	31	43
Morton	32	39
Morton	32	40
Morton	32	41
Morton	32	42
Morton	32	43
Morton	33	41
Morton	33	42
Morton	33	43
Morton	34	42
Morton	34	43
Morton	35	39
Morton	35	40
Morton	35	41
Morton	35	42
Morton	35	43
Seward	31	31
Seward	31	32
Seward	31	33
Seward	31	34
Seward	32	31
Seward	32	32
Seward	32	33
Seward	32	34
Seward	34	31
Seward	34	32
Seward	34	33
Seward	35	31
Seward	35	32
Seward	35	33
Stanton	27	39
Stanton	27	40
Stanton	27	41
Stanton	27	42
Stanton	27	43
Stanton	28	39
Stanton	28	40
Stanton	28	41
Stanton	28	42
Stanton	28	43
Stanton	29	39
Stanton	29	40
Stanton	29	41
Stanton	29	42
Stanton	29	43
Stanton	30	39
Stanton	30	40
Stanton	30	41
Stanton	30	42
Stanton	30	43
Stevens	31	35
Stevens	31	36
Stevens	31	37
Stevens	31	38
Stevens	31	39
Stevens	32	35
Stevens	32	36
Stevens	32	39
Stevens	33	35
Stevens	33	38
Stevens	34	35
Stevens	34	38
Stevens	35	38
Stevens	35	39

(b) The closure of the townships to new appropriations of water from the high plains aquifer as listed in subsection (a) shall not apply to the following:

(1) Wells for domestic use;

(2) wells authorized by temporary permits;

(3) wells authorized by term permits of fewer than five years; and

(4) wells authorized by an application to appropriate 15 acre-feet of water or less if the following conditions are met:

(A) The allowable aquifer yield has been exceeded, but the sum of the annual quantity requested by the proposed appropriation and the total quantities authorized by prior permits because of this exemption does not exceed 15 acre-feet in a radius of ½ mile surrounding the proposed point of diversion.

(B) Well spacing criteria have been met.

(C) Approval of the application will not authorize an additional quantity of water out of an existing well authorized by a nondomestic approval of application or water right that would result in a total combined annual quantity of water authorized from that well in excess of 15 acre-feet.

(D) All other criteria for processing a new application have been met. (Authorized by K.S.A. 82a-706a and K.S.A. 82a-1028; implementing K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-1028; effective Sept. 22, 2000; amended Nov. 21, 2003.)

5-23-5. (Authorized by K.S.A. 1980 Supp. 82a-1028(o); implementing K.S.A. 1980 Supp. 82a-1028(n); effective May 1, 1981; revoked Nov. 21, 2003.)

5-23-6. Water-measuring devices. The

diversion works for each nontemporary, nondomestic well located within the boundaries of the district shall be equipped with a water flowmeter that meets or exceeds the specifications in K.A.R. 5-1-4 through 5-1-12.

(a) The owner shall perform the following:

(1) Ensure that the water flowmeter is installed according to specifications in K.A.R. 5-1-4 through 5-1-12;

(2) maintain the water flowmeter in proper working condition whenever the diversion of water for nondomestic use can reasonably be expected to occur; and

(3) promptly initiate action to repair or replace any water flowmeter that is out of compliance, and correct any problems with the installation of a water flowmeter.

(b) The owner shall notify the district, on a form prescribed by the district, within 30 days after any of the following:

(1) A new water flowmeter is installed.

(2) A water flowmeter is repaired and reinstalled.

(3) A water flowmeter is repaired without removing the water flowmeter.

(4) An improper water flowmeter installation has been corrected.

(c) An extension of time to install a water flowmeter may be granted by the district for a reasonable period of time if just cause is shown to the district. Each appeal shall be filed with the board at least 10 days before a regularly scheduled board meeting. Just cause may include any of the following:

(1) A contract has been signed by the owner and the seller to sell or install the water flowmeter, but the seller cannot complete the sale or installation before diversion of water will take place.

(2) Weather conditions prevent the water flowmeter from being installed before the diversion of water.

(3) Legal proceedings prevent the owner from installing the water flowmeter.

(4) The supply of natural gas to power the well has been cut off by the seller of the natural gas for reasons beyond the control of the owner of the water right.

(d) A water flowmeter shall not be required to be installed if any of the following criteria is met:

(1) A well is authorized to divert 15 acre-feet or less per calendar year.

(2) Two or more wells are authorized by the same water right or approval of application with one authorized annual quantity of water for all the wells, and all of the water diverted by all of the wells is measured by a single water flowmeter prior to its application to beneficial use.

(3) The well is enrolled in a multiyear federal conservation program or the water rights conservation program pursuant to K.A.R. 5-7-4.

(4) The well is registered as inactive with the Kansas department of health and environment.

(5) An affidavit is filed by the owner with the district stating that the well is not, and will not be, operated until a water flowmeter meeting the specifications in K.A.R. 5-1-4 through 5-1-12 is properly installed. Thirty days before operating the well, the owner shall file a notice with the district indicating that a water flowmeter has been installed and indicate when the owner proposes to begin the diversion of water. (Authorized by and implementing K.S.A. 82a-1028, as amended by L. 2002, Ch. 137, § 5; effective May 1, 1981; amended May 1, 1985; amended Jan. 10, 2003.)

5-23-7 and 5-23-8. (Authorized by K.S.A. 1980 Supp. 82a-1028(o); implementing K.S.A. 1980 Supp. 82a-1028(n); effective May 1, 1981; revoked May 1, 1985.)

5-23-9. (Authorized by K.S.A. 1980 Supp. 82a-1028(o); implementing K.S.A. 1980 Supp. 82a-1028(n); effective May 1, 1981; revoked Aug. 28, 1989.)

5-23-10. Reserved.

5-23-11. Procedures for non-compliance with rules and regulations. The district, its board or manager, any eligible voter within the district, or any person residing within the district that is at least eighteen (18) years of age, may file a written complaint with the district alleging a violation of these rules and regulations, the management program, the groundwater management district act (K.S.A. 82a-1020 *et seq.*), or the water appropriation act (K.S.A. 82a-701 *et seq.*). The written complaint shall be filed at the district office.

Within thirty (30) days following the filing of the complaint, a representative of the district designated by the board shall investigate the complaint. If the representative of the district finds that a violation has existed or presently exists, the representative shall issue a written directive to the violator stating the nature of the violation and directing the violator to come into compliance with these rules and regulations.

If the violator fails to comply with the directive, the district may: (1) Seek to enjoin the violator's use of water by suitable action in district court until such time as the violator complies; or

(2) Seek the assistance of the chief engineer and the attorney general of the state of Kansas to enjoin the violator's use of water until such time as the violator complies. (Authorized by K.S.A. 1980 Supp. 82a-1028(o); implementing K.S.A. 1980 Supp. 82a-1028(n); effective May 1, 1981.)

5-23-14. Dakota aquifer system. All evaluations in the southwest Kansas groundwater management district no. 3 involving a determination of the extent of the confined and unconfined Dakota aquifer system shall use the information shown in the Kansas geological survey open file report number 98-37, released August 1998, which is hereby adopted by reference, unless the applicant or the district provides, or the chief engineer has available, better or more site-specific data concerning the extent of the confined and unconfined Dakota aquifer system. (Authorized by K.S.A. 82a-706a and K.S.A. 82a-1028(o); implementing K.S.A. 82a-709, K.S.A. 1999 Supp. 82a-711, and K.S.A. 82a-1028(n); effective Sept. 22, 2000.)

5-23-15. Saturated thickness of the high plains aquifer. All evaluations in the southwest Kansas groundwater management district no. 3 involving a determination of the saturated thickness of the high plains aquifer shall use the information shown in the Kansas geological survey open file report number 98-52, plate B, released February 1999, which is hereby adopted by reference, unless the applicant or the district provides, or the chief engineer has available, better or more site-specific data concerning the saturated thickness of the high plains aquifer. (Authorized by K.S.A. 82a-706a and K.S.A. 82a-1028(o); implementing K.S.A. 1999 Supp. 82a-711 and K.S.A. 82a-1028(n); effective Sept. 22, 2000.)

Article 24.—NORTHWEST KANSAS GROUNDWATER MANAGEMENT DISTRICT NO. 4

5-24-1. Definitions. As used in these regulations for the northwest Kansas groundwater management district no. 4, the following words and phrases shall have the following meanings. (a) "Area of consideration" means the two-mile-radius circle whose center is the location of the proposed point of diversion. The area of consideration equals 8,042 acres minus any area of the circle that is outside the state of Kansas.

(b) "Base acreage" has the meaning specified in K.A.R. 5-5-11(a).

(c) "Battery of wells" has the meaning specified in K.A.R. 5-1-1.

(d) "Board" means the board of directors constituting the governing body of the northwest Kansas groundwater management district no. 4.

(e) "District" means the northwest Kansas groundwater management district no. 4.

(f) "Tailwater" means that portion of the applied irrigation water that becomes runoff from the authorized place of use.

(g) "Theis analysis" means the Theis non-equilibrium equation analysis described in pp. 108-113 in "ground water and wells: a reference book for the water-well industry," published by Edward E. Johnson, Inc., Saint Paul, Minnesota, in 1966. The pages specified in this subsection are hereby adopted by reference.

(h) "Usable water" means water containing not more than 10,000 milligrams per liter of total dissolved solids.

(i) "Waste of water" has the meaning specified in K.A.R. 5-1-1.

(j) "Well" means any excavation that is drilled, cored, bored, washed, driven, dug, or otherwise constructed if the intended use of the excavation is for the acquisition, diversion, or artificial recharge of groundwater. (Authorized by K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-1028; implementing K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-1028; effective May 1, 1983; amended May 1, 1985; amended Jan. 30, 2004.)

5-24-2. Allowable withdrawals. (a) Except as set forth in subsection (b) below, each application for an approval of application and each application for a change in the point of diversion shall be subject to the following requirements:

(1) The sum of the annual quantities of water of the proposed appropriation, the vested rights, prior appropriation rights, and earlier priority applications with a point of diversion authorized or proposed within the area of consideration that withdraw water from the same source of supply as the proposed point of diversion, as a hydraulically connected source of supply, shall not exceed the calculated quantity of annual recharge received by the aquifer underlying the area of consideration. The quantity authorized on all prior

permits, certificates, and vested rights, and the quantity requested on prior applications shall be used to calculate the sum of prior appropriations.

(2) All limitation clauses listed on permits and certificates shall be considered to be in force.

(3) In the case of an application for change in the point of diversion, all applications with a priority earlier than the priority established by the filing of the application for change shall be included in the analysis.

(4) The allowable annual appropriation shall be calculated using the formula Q = AR/12, in which the following values are used:

(A) Q is the allowable annual appropriation in acre-feet per year.

(B) A is the area of consideration.

(C) R is the average annual recharge in inches per year.

(5) The value of .5 inch per year shall be used for recharge, including natural recharge and return flow from irrigation.

(6) If a portion of the area of consideration is outside the district boundary, the evaluation shall be conducted as though the entire area of consideration were within the district boundary. If the perimeter of the area of consideration intersects a group of wells authorized under prior applications, permits, certificates, or vested rights, a reasonable quantity of water shall be assigned to each well based upon the best available information.

(b) The following types of applications shall not be subject to this regulation:

(1) A nondomestic application for an approval of application if the proposed point of diversion meets the following criteria:

(A) Is to be located in an alluvial aquifer not closed to new appropriations, except for domestic use, temporary permits, and term permits for five or fewer years;

(B) meets the well spacing requirements of K.A.R. 5-24-3; and

(C) meets the safe yield requirements of K.A.R. 5-3-9, K.A.R. 5-3-10, and K.A.R. 5-3-11;

(2) a nondomestic application to appropriate water from one or more of the following sources of supply:

(A) Niobrara;

(B) Carlile;

(C) Greenhorn;

(D) Dakota;

(E) Kiowa; or

(F) the Cheyenne formations if both of the following conditions are met:

(i) The well spacing requirements of K.A.R. 5-24-3 are met; and

(ii) the proposed point of diversion is located in an area where there is a natural hydraulic connection between all of the formations from which the applicant proposes to divert water;

(3) an application for a permit to appropriate water for domestic use;

(4) an application for a term permit for five years or less;

(5) an application for a temporary permit;

(6) an application for change in point of diversion if either of the following conditions is met:

(A) The authorized well has been drilled, cased, and test-pumped; or

(B) the authorized diversion works have been completed and a notice of completion was timely filed with the chief engineer under the current water right or approval of application;

(7) an application for an approval of application filed on an existing well currently authorized by a vested right, appropriation right, or approval of application that requests a quantity of water equal to or less than the currently available quantity of water that will be conjunctively reduced from a well authorized by either a vested right or certified appropriation right meeting either of the criteria specified in paragraph (c)(1);

(8) an application for an approval of application that meets the criteria of K.A.R. 5-24-10; and

(9) an application for an additional rate of diversion only that meets the requirements of K.A.R. 5-4-5.

(c)(1) To be exempt from this regulation, each application for an approval of application filed on an existing well currently authorized by a vested right, appropriation right, or approval of application that requests a quantity of water equal to or less than the currently available quantity of water that will be conjunctively reduced from a well authorized by either a vested right or certified appropriation right shall meet either of the following criteria:

(A) Be located within 2,640 feet of the existing well that will have its authorized quantity reduced; or

(B) be located within a distance from the currently authorized well for which a Theis analysis shows a .5 foot or greater drawdown, using the following assumptions:

(i) The certified rate of diversion of the currently authorized well;

(ii) the certified annual quantity of water for the currently authorized well;

(iii) the pumping time equal to the time it takes to pump the certified annual quantity at the certified rate of diversion;

(iv) the drawdown computed at the time equal to the pumping time; and

(v) the transmissivity and storage coefficient derived either from a time drawdown aquifer pump test of the currently authorized well or from use of the well log from the currently authorized well or a well log from a test hole or well located within 300 feet of the currently authorized well, using the procedure described in pages 26-27 of the United States geological survey's water-resources investigations report 85-4198, published in 1985. The pages specified in this paragraph are hereby adopted by reference.

(2)(A) For water rights authorized for irrigation use, the currently available quantity of water shall be calculated as follows:

(i) Determine the maximum number of acres actually irrigated during the perfection period. For vested rights, use the maximum number of acres irrigated in any one calendar year before June 29, 1945; and

(ii) use the 80 percent chance rainfall net irrigation requirements (NIR) for corn as set forth in K.A.R. 5-5-12 to determine the NIR for each acre, and then divide that value by .85 to adjust for efficiency.

(B) For non-irrigation water rights, the currently available quantity of water shall not exceed the actual consumptive use during the perfection period.

(3) Each well that has a reduced or new water right pursuant to this subsection shall be equipped with a water flowmeter meeting the requirements of article one of the chief engineer's regulations.

(4) The maximum distance that a well shall be relocated under paragraph (c)(1)(B) shall be the distance computed as described in paragraph (c)(1)(B), or 3,960 feet, whichever is less.

(5) The historic consumptive use of a well meeting the requirements of paragraph (b)(7) that is accounted for in the Republican river compact, K.S.A. 82a-518 and amendments thereto, accounting as a stream depletion reaching the Republican river downstream of Trenton dam shall not be transferred to a well that would cause a depletion reaching the Republican river upstream of Trenton dam.

(6) The total net acreage authorized by the following shall not exceed the current net total authorized acreage for both wells:

(i) The approval of application;

(ii) the water right being reduced; and

(iii) the water right currently authorizing the well for which the new water right is sought. (Authorized by K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-1028; implementing K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-1028; effective May 1, 1983; amended May 1, 1985; amended May 1, 1987; amended Aug. 19, 1991; amended Jan. 30, 2004.)

5-24-3. Well spacing. (a) Except as specified in subsection (b), the spacing between each proposed well and all other wells authorized to withdraw water from the same source of water supply shall be as follows:

(1) In the Ogallala aquifer and in alluvial aquifers not closed to new appropriations, the required minimum spacing for nondomestic, nontemporary wells shall be as follows:

(A) 0 to 175 acre-feet requested: a minimum spacing of 1,400 feet;

(B) 176 to 350 acre-feet requested: a minimum spacing of 2,000 feet;

(C) 351 to 575 acre-feet requested: a minimum spacing of 2,400 feet; and

(D) more than 575 acre-feet requested: a minimum spacing of 2,800 feet.

(2) If the quantity of water authorized or applied for includes a fraction of an acre-foot, the quantity of water shall be rounded off to the nearest acre-foot of water for the purpose of applying this regulation.

(3) Each nondomestic well shall be spaced a minimum of 800 feet from each domestic well constructed in the same aquifer unless the chief engineer determines that one of the following criteria is met:

(A)(i) The domestic well is owned by the applicant;

(ii) the applicant signs a written request to waive the spacing requirement to the domestic well;

(iii) the applicant submits information documenting the location and depth of the domestic well, and any other information necessary to determine whether the domestic well is likely to be impaired; and

(iv) a Theis analysis or other hydraulic analysis done by the chief engineer shows that the do-

mestic well is not likely to be impaired by the proposed well; or

(B)(i) The owner of the domestic well signs a written request to waive the spacing requirement to the domestic well;

(ii) the applicant submits information documenting the location and depth of the domestic well, and any other information necessary to determine whether the domestic well is likely to be impaired; and

(iii) a Theis analysis or other hydraulic analysis done by the chief engineer shows that the domestic well is not likely to be impaired by the proposed well.

(4) Each nondomestic application for additional water from an existing well already authorized by one or more water rights shall meet the minimum spacing requirements in paragraph (a)(1) for the cumulative total of all existing water rights, earlier appropriations, and the proposed appropriation for that well.

(5) For a battery of wells, the well spacing shall meet the minimum spacing in paragraph (a)(1) based on the total amount of water applied for by the battery of wells. The minimum spacing distance shall be measured from the geocenter of the proposed battery of wells.

(6) Nondomestic wells withdrawing water from a cretaceous aquifer shall be spaced a minimum of four miles from all other wells withdrawing water from a hydraulically connected cretaceous aquifer. The spacing between a nondomestic well withdrawing water from a cretaceous aquifer and a domestic well withdrawing water from the same aquifer shall be a minimum of 2,640 feet unless one of the following criteria is met:

(A)(i) The domestic well is owned by the applicant;

(ii) the applicant signs a written request to waive the spacing requirement to the domestic well;

(iii) the applicant submits information documenting the location and depth of the domestic well, and any other information necessary to determine whether the domestic well is likely to be impaired; and

(iv) a Theis analysis or other hydraulic analysis by the chief engineer shows that the domestic well is not likely to be impaired by the proposed well; or

(B)(i) The owner of the domestic well signs a written request to reduce the spacing requirement to the domestic well;

(ii) the applicant submits information documenting the location and depth of the domestic well, and any other information necessary to determine whether the domestic well is likely to be impaired; and

(iii) a Theis analysis or other hydraulic analysis done by the chief engineer shows that the domestic well is not likely to be impaired by the proposed well.

(b) The well spacing requirements of subsection (a) shall not apply to the following:

(1) Spacing to a standby well;

(2) spacing to another well if either of the following conditions is met:

(A)(i) The other well is owned by the applicant;

(ii) the owner of the other well signs a written request to reduce the spacing requirement to the other well;

(iii) the applicant submits information documenting the location and depth of the other well, and any other information necessary to determine whether the other well is likely to be impaired by the proposed well; and

(iv) a Theis analysis or other hydraulic analysis done by the chief engineer shows that the proposed well is not likely to impair the other well; or

(B)(i) The owner of the other well files a written request to waive the spacing requirement to the proposed well;

(ii) the applicant submits information documenting the location and depth of the other well, and any other information necessary to determine whether the other well is likely to be impaired by the proposed well; and

(iii) a Theis analysis or other hydraulic analysis done by the chief engineer shows that the proposed well is not likely to impair the other well;

(3) a replacement well that meets one of the following criteria:

(A) The well is being replaced within 300 feet of the currently authorized location; or

(B) both of the following conditions are met:

(i) The proposed replacement well location increases the spacing to all other wells for which the spacing requirement was not met on the date the application for a change in point of diversion was filed; and

(ii) the proposed replacement well location continues to meet the requirements for spacing to all wells for which the well spacing requirement

was met at the time the application for change in point of diversion was filed; and

(4) an additional well if the original well and the additional well are owned by the same owner or owners. (Authorized by K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-1028; implementing K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-1028; effective May 1, 1983; amended Jan. 30, 2004.)

5-24-4. Tailwater control and waste. No person shall commit or allow a waste of water as defined in K.A.R. 5-1-1. Runoff from precipitation shall not be considered a waste of water. (Authorized by K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-1028; implementing K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-1028; effective May 1, 1983; amended Jan. 30, 2004.)

5-24-5. Allowable appropriation—reasonable use. (a) The maximum reasonable annual quantity of water for irrigation use shall not exceed the standards adopted in K.A.R. 5-3-19, K.A.R. 5-3-20, K.A.R. 5-3-21, K.A.R. 5-3-23, and K.A.R. 5-3-24.

(b) The annual quantity of water deemed reasonable on an application for municipal use shall be determined using the following criteria:

(1) The annual quantity of water needed for residential use shall be based on a population projection for the ensuing 20 years. The projected population shall be determined by extending present population for 20 years at one and one-half percent per year increase.

(2) The total quantity of water reasonable for the residential population shall then be determined by the following:

(A) Multiplying the projected population by the current per capita use; and

(B) adding a reasonable quantity of water for the present and projected industrial use for the ensuing 20-year-period.

(3) Municipalities may purchase, condemn, or otherwise acquire existing water rights in excess of the quantities set forth in paragraphs (b) (1) and (2) and apply to the chief engineer to change a reasonable quantity of the acquired water rights for municipal use, which shall not exceed 200 percent of the quantity considered reasonable pursuant to paragraphs (b)(1) and (2).

(c) The quantities of water deemed to be reasonable for livestock and poultry shall be determined pursuant to K.A.R. 5-3-22.

(d) All applications for any other type of beneficial use shall be reviewed to determine if the annual quantity of water and rate of diversion requested are reasonable for the intended use based on the best information available. (Authorized by K.S.A. 82a-1028, as amended by L. 2002, Ch. 137, § 5, and K.S.A. 82a-706a; implementing K.S.A. 82a-1028, as amended by L. 2002, Ch. 137, § 5; effective May 1, 1983; amended Aug. 19, 1991; amended Jan. 10, 2003.)

5-24-6. Changes in points of diversion. (a) Each replacement well shall meet all of the criteria in either of the following paragraphs:

(1)(A) Be located within 2,640 feet of the currently approved well location; and

(B) meet the well spacing criteria of K.A.R. 5-24-3; or

(2)(A) Be located within a distance from the currently authorized well for which a Theis analysis shows a .5 foot or greater drawdown, using the following assumptions:

(i) The certified rate of diversion of the currently authorized well;

(ii) the certified annual quantity of water for the currently authorized well;

(iii) the pumping time equal to the time it takes to pump the certified annual quantity at the certified rate of diversion;

(iv) the drawdown computed at the time equal to the pumping time;

(v) the transmissivity and storage coefficient derived either from a time drawdown aquifer pump test of the currently authorized well or from use of the well log from the currently authorized well or a well log from a test hole or well located within 300 feet of the currently authorized well, using the procedure specified in K.A.R. 5-24-2(c)(1)(B)(v); and

(B) meet the well spacing criteria of K.A.R. 5-24-3.

(b) The maximum distance that a well may be relocated under paragraph (a)(2) shall be the distance computed as specified in paragraph (a)(2), or 3,960 feet, whichever is less. If the historic consumptive use of the well being replaced is accounted for in the Republican river compact, K.S.A. 82a-518 and amendments thereto, accounting as a stream depletion reaching the Republican river downstream of Trenton dam, that consumptive use shall not be transferred to a well that would cause a depletion reaching the Republican river upstream of Trenton dam.

(c) No change in a point of diversion application that proposes to change the authorized point

of diversion from one well to a battery of wells shall be approved unless at least one of the following conditions has been met:

(1) Water is available for appropriation pursuant to K.S.A. 5-24-2 at the geocenter of the proposed battery of wells or would be available if the current water right were dismissed.

(2) The proposed battery of wells meets the requirements of K.A.R. 5-2-3. (Authorized by K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-1028; implementing K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-1028; effective May 1, 1983; amended May 1, 1987; amended Jan. 30, 2004.)

5-24-7. Well construction criteria. (a) Each nondomestic well that is not subject to regulation under the Kansas chemigation safety law, K.S.A. 2-3301 et seq., and amendments thereto, and that is completed after May 1, 1983 shall include the installation of a check valve that meets or exceeds specifications adopted by the chief engineer which were in effect at the time the well was completed.

(b) All wells, including domestic wells, to be completed in a cretaceous aquifer shall be constructed in a manner that prevents the cretaceous aquifer from mixing with all quaternary, tertiary, and any other cretaceous water-bearing strata that have no natural hydraulic connection between the formation or formations in which the well will be screened. (Authorized by and implementing K.S.A. 82a-1028; effective May 1, 1983; amended Jan. 10, 2003.)

5-24-8. Resource development plans. (a) A resource development plan may be required by the district to be submitted for any of the following:

(1) A new application to appropriate water for irrigation use;

(2) a nonemergency application to change the place of use or the use made of water from irrigation to another type of use that involves an actual physical change in operation; or

(3) a new application to appropriate water for nonirrigation purposes if one of the following criteria is met:

(A) The quantity of water requested is likely to be unreasonable.

(B) The proposed beneficial use is likely to be inefficient.

(C) The proposed operation is likely to result in a waste of water.

(D) The owner or operator has a recent, documented history of noncompliance with the provisions of the Kansas water appropriation act or regulations adopted pursuant to the act.

(b) Each resource development plan shall include a description of the proposed operation, including the diversion works, the distribution system, and all other matters necessary to determine whether the proposed annual quantity of water is likely to be reasonable and not wasteful.

(c)(1) The applicant shall be notified by the district whenever an applicant is required to submit a resource development plan. This notification shall include the deadline for submitting the plan. The district shall then review the plan and submit it to the chief engineer with one of the following recommendations:

(A) The application should be approved because the proposed plan meets the regulatory requirements, and those portions of the plan consistent with the conservation plan guidelines adopted by the Kansas water office should be required as a conservation plan as a condition of the approval of application.

(B) The application should be approved if certain changes are made to the plan, and the amended plan should be required as a condition of the approval of application insofar as it is consistent with the water conservation planning guidelines adopted by the Kansas water office.

(C) The plan does not meet the regulatory requirements, and the application should not be approved.

(2) Each water conservation plan required by the chief engineer shall be made a condition of the approval of application. The required water conservation plan shall be fully implemented before diversion of water occurs pursuant to that approval of application. After the plan is implemented, the owner shall maintain the plan in a satisfactory manner.

(d) In addition to meeting the requirements specified in subsection (b), for irrigation use, the resource development plan shall meet the following requirements:

(1) Include irrigation system design, tailwater control methods, well yield, and cropping patterns; and

(2) comply with design criteria meeting the following requirements:

(A) Are set forth in the national engineering handbook (NEH), part 652, irrigation guide, dated November 13, 1997, as amended through

the Kansas state supplement dated May 8, 2003, which is hereby adopted by reference; and

(B) are consistent with the "irrigation water conservation program for the state of Kansas," published by the Kansas water office in November 1993 and hereby adopted by reference.

(e) For municipal use, the plan shall comply with the "Kansas 1990 municipal water conservation plan guidelines," second edition, which is published by the Kansas water office and hereby adopted by reference.

(f) In addition to meeting the requirements specified in subsection (b), for all other types of beneficial use, the resource development plan shall include a description of the proposed use of water in sufficient detail to determine if the proposed use is reasonable and not wasteful. (Authorized by K.S.A. 2002 Supp. 82a-1028 and K.S.A. 82a-706a; implementing K.S.A. 2002 Supp. 82a-1028; effective Jan. 10, 2003; amended Jan. 30, 2004.)

5-24-9. Water flowmeters. (a) Each of the following types of wells shall be equipped with a water flowmeter meeting the water flowmeter and installation specifications in K.A.R. 5-1-4 through K.A.R. 5-1-12 at the time the well is permitted:

(1) Any nondomestic, nontemporary well permitted or drilled after May 1,1980;

(2) any nondomestic, nontemporary well actually drilled after May 1, 1980 pursuant to an approval of an application for a change in point of diversion; and

(3) any well reduced in annual quantity of water authorized in order to allow approval of another application pursuant to K.A.R. 5-24-2.

(b) In addition to meeting the requirements of this regulation, each owner shall meet the requirements specified in K.A.R. 5-3-5e. (Authorized by K.S.A. 82a-1028, as amended by L. 2002, Ch. 137, § 5, and K.S.A. 82a-706a; implementing K.S.A. 82a-1028, as amended by L. 2002, Ch. 137, § 5, and K.S.A. 2001 Supp. 82a-1903, as amended by L. 2002, Ch. 137, § 7; effective Jan. 10, 2003.)

5-24-10. Exemptions for up to 15 acre-feet of groundwater. (a) In any area of the district that is subject to safe yield criteria and is not closed by specific regulation or intensive groundwater use control area order by the chief engineer to new nondomestic, nontemporary permits and term permits for five or fewer years, applications to appropriate groundwater shall be exempt from meeting the safe yield criteria if all the following conditions are met:

(1) The sum of the annual quantity requested by the proposed appropriation and the total annual quantities authorized by prior permits allowed because of an exemption pursuant to this regulation does not exceed 15 acre-feet in a one-mile-radius circle surrounding the proposed point of diversion.

(2) Well spacing criteria have been met.

(3) The approval of the application does not authorize an additional quantity of water out of an existing authorized well with a nondomestic permit or water right that would result in a total combined annual quantity of water authorized from that well in excess of 15 acre-feet.

(4) The approval of the application does not authorize an additional quantity of water to be used on a currently authorized nondomestic place of use.

(b) After the use of up to 15 acre-feet has been approved pursuant to this regulation, no application for change shall be approved for any quantity of water that would authorize the water to be diverted from a currently authorized point of diversion or onto a currently authorized place of use. (Authorized by K.S.A. 82a-1028, as amended by L. 2002, Ch. 137, § 5, and K.S.A. 82a-706a; implementing K.S.A. 82a-1028, as amended by L. 2002, Ch. 137, § 5; effective Jan. 10, 2003.)

5-24-11. Investigation and enforcement. The procedure set forth in this regulation shall be followed whenever enforcement action is taken by the district after it becomes aware that a person could be violating any of the regulations adopted by the chief engineer that relate to conservation and management of groundwater within the district.

(a) If a violation is discovered by the district's staff, the enforcement procedure shall begin with the step specified in subsection (c). In all other cases, a complaint may be filed with the district either verbally or in writing. The complaint shall describe and specify the following:

(1) The nature of the alleged violation;

(2) the location of the alleged violation;

(3) the name of the complainant;

(4) the mailing address of the complainant; and

(5) any other information necessary for the staff to understand the alleged violation and assist the staff in investigating the complaint.

(b) Before the staff makes any field investiga-

tion of the complaint, the staff shall make at least one attempt to contact an owner, operator, or other responsible representative of the water right or approval of application to notify the individual that a field investigation will be made.

(c) The district's staff shall make an investigation under either of the following circumstances:

(1) A complaint has been filed with the district, and the requirement specified in subsection (b) has been met.

(2) The district's staff discovers a violation of any regulation adopted by the chief engineer relating to conservation and management of groundwater within the district.

(d) A written report of the investigation shall be prepared by the staff. This report shall include any documents relied on or prepared by the staff in investigating the complaint or internally discovered violation. The report shall become a part of the official district record concerning the investigation. If a water right or an approval of application is involved, the report shall be made a part of that file.

(e) If the investigation shows that no violation has occurred or that enforcement action is not warranted, a copy of the report shall be sent to the complainant, if the investigation was prompted by a complaint, and the water right owner. A copy shall be retained in the district office. No further enforcement action shall be taken by the district at that time.

(f)(1) If the investigation determines or confirms that a violation has occurred, the report shall contain an order issued by the district staff, which shall be sent by restricted mail to the water right owner as shown in the district records and to any other person who is known by the district to have been committing the violation. The order shall specify and include the following:

(A) A description of the violation, including the specific regulations that are being violated;

(B) the actions necessary to correct the violation;

(C) a reasonable time frame to correct the violation;

(D) a statement that extensions of time to correct any violation may be granted by the staff if good cause is shown by the water right owner or other responsible party;

(E) a statement that the order is effective immediately;

(F) a statement that if the violation is corrected within the time specified by the order, the violator is required to notify the district, and an inspection will be conducted by the staff to determine if the violation has ceased;

(G) a statement that if any party desires to appeal an order issued by the staff, an appeal to the board is required to be requested within 15 days of the issuance of the order by a water right owner or violator;

(H) a statement that the request for an appeal may also request a stay of the order. If the requestor demonstrates good cause for a stay, a stay of the order may be granted by the staff or the board; and

(I) a statement that any subsequent violations of the same nature will be handled as a continuation of the current violation, not a new violation.

(2) A copy of the report shall be sent to the complainant.

(g) If the violation is corrected within the time frame specified by the order, the violator shall notify the district, and an inspection shall be conducted by the staff to determine if the violation has ceased. If the staff investigation determines that the violation has been corrected within the time frame specified by the order and in accordance with the district order, the enforcement activity by the district shall cease.

(h) If the violation has not been corrected within the time frame specified in the order and in the manner specified in the order, one or more of the following actions may be taken by the board:

(1) Seeking an injunction to stop the violation;

(2) requesting enforcement assistance from the chief engineer; or

(3) requesting enforcement assistance from the attorney general. (Authorized by K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-1028; implementing K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-1028; effective Jan. 30, 2004.)

Article 25.—BIG BEND GROUNDWATER MANAGEMENT DISTRICT NO. 5

5-25-1. Definitions. As used in these regulations for the Big Bend groundwater management district no. 5, unless the context clearly requires otherwise, the following words and phrases shall have the meaning ascribed to them in this regulation:

(a) "Aquifer" means a geologic formation capable of yielding water in a quantity sufficient to supply water to a spring or pumping well.

(b) "Baseflow" means groundwater that seeps, flows, or is otherwise naturally discharged from an aquifer into a stream.

(c) "Baseflow node" means an artificial point located in the channel of a stream for the purpose of allocating a proportional amount of the baseflow to be considered when evaluating a new application to appropriate water from a proposed point of diversion located within two miles of the node.

(d) "Baseflow node allocation" means the annual quantity of water assigned to a baseflow node expressed in acre-feet per year. The baseflow node allocation shall be based on the natural discharge to a stream, which shall be the rate of flow in the stream that is equaled or exceeded 90 percent of the time.

(e) "Bedrock aquifer" means any consolidated material and unconsolidated material that is older than the Dakota formation of the Dakota aquifer system, as defined in K.A.R. 5-1-1, and that will yield water in a quantity sufficient to supply a spring or a pumping well.

(f) "Board" means the board of directors constituting the governing body of the Big Bend groundwater management district no. 5.

(g) "Dakota aquifer" means that portion of the Cretaceous Dakota formation that is capable of yielding water in a quantity sufficient to supply water to a spring or pumping well.

(h) "District" means the Big Bend groundwater management district no. 5.

(i) "Neat cement" means one 94-pound bag of Portland cement mixed with five to six gallons of clean water.

(j) "Portland cement" means class A, type I cement.

(k) "Stream" means any watercourse, or part of a watercourse, with a well-defined bed and banks that flows continuously during the calendar year, except during a drought.

(l) "Sustainable yield" means the long-term yield of the source of supply, including hydraulically connected surface water or groundwater, allowing for the reasonable raising and lowering of the water table.

(m) "Well" means any excavation that is drilled, cored, bored, washed, driven, dug, or otherwise constructed, either by nature or by man, when the proposed use of the excavation is for the acquisition, diversion, or artificial recharge of groundwater. (Authorized by K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-1028; implementing K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-1028; effective May 1, 1980; amended May 1, 1987; amended April 19, 1996; amended Oct. 31, 2003.)

5-25-2. Well spacing. (a) With the exception of those wells described in subsection (b), the minimum spacing of all wells described in an application to appropriate water for beneficial use, other than those wells for domestic use, shall be 1,320 feet from the following:

(1) All other non-domestic wells and proposed non-domestic wells that carry an earlier priority; and

(2) baseflow nodes.

Non-domestic wells shall be 660 feet from all existing domestic wells, except those domestic wells owned by the applicant.

(b)(1) Each replacement well drilled within 100 feet of the originally authorized point of diversion shall be exempt from the well spacing requirement of subsection (a).

(2) Each non-domestic well that proposes the withdrawal of groundwater from the Dakota aquifer or any bedrock aquifer shall be one mile from all other wells withdrawing groundwater from the same formation, including domestic wells, except those domestic wells owned by the applicant. (Authorized by K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-1028; implementing K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-1028; effective May 1, 1980; amended April 19, 1996; amended Oct. 31, 2003.)

5-25-2a. Change in point of diversion. (a) The location of a well requested in an application to change a point of diversion shall be no more than 2,640 feet from the point of diversion currently authorized by a vested right, appropriation right, or an application to appropriate water for beneficial use. This well shall also meet the minimum spacing requirement established in K.A.R. 5-25-2. If the point of diversion was not completed at the currently authorized point of diversion, the location of a well requested in an application to change the point of diversion shall be no more than 2,640 feet from the last authorized point of diversion for which the diversion works were completed.

(b) If the current authorization for a well requires one or more observation wells to be installed in accordance with K.A.R. 5-25-10, then the approval of an application for a change in the point of diversion shall also require the installation of one or more new observation wells in accord-

ance with K.A.R. 5-25-10 if either of the following conditions exists:

(1) The well is proposed to be located 300 feet or more from the currently authorized well location.

(2) The well is proposed to be located more than 50 feet and less than 300 feet from the currently authorized well location, and the water quality analysis required pursuant to K.A.R. 5- 25-10 shows that the chloride concentration exceeds 500 milligrams per liter (mg/l) at the currently authorized well location.

(c) The number and location of test holes or observation wells required for the approval of an application to change the point of diversion from a single well to a battery pursuant to subsection (b) shall be based on the locations and the number of wells in the proposed battery. Hydrologic factors, including groundwater flow direction, lithology, and chlorides at the location, shall be considered.

(d) An approval of an application to change the point of diversion shall not authorize the proposed well to be completed in an aquifer other than the aquifer or aquifers in which the currently authorized well was authorized to be completed. (Authorized by K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-1028; implementing K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-1028; effective Oct. 31, 2003.)

5-25-3. Reasonable appropriation. (a) An application for a permit to appropriate water for irrigation use shall not be recommended by the board for approval for a quantity in excess of those quantities specified in K.A.R. 5-3-19.

(b) For livestock and poultry, the maximum annual quantity of water shall be limited to those quantities specified in K.A.R. 5-3-22.

(c) For all uses of water, the quantity of water requested shall be reasonable for the proposed beneficial use, and the approval shall neither impair an existing right nor prejudicially and unreasonably affect the public interest. (Authorized by K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-1028; implementing K.S.A. 82a-706, K.S.A. 82a-706a, K.S.A. 2002 Supp. 82a-711, and K.S.A. 2002 Supp. 82a-1028; effective May 1, 1980; amended April 19, 1996; amended Oct. 31, 2003.)

5-25-4. Sustainable yield. (a) Except as set forth in subsections (b) and (c), the district has been determined to be appropriated to the sustainable yield level, and therefore the entire district shall be closed to further new surface water and groundwater appropriations filed on or after December 17, 1998.

(b) The following types of applications shall be exempt from the closure of the district to new appropriations of water described in subsection (a):

(1) Domestic use;

(2) temporary permits;

(3) applications for a change in the point of diversion for which the diversion works have been completed under the original approved application;

(4) standby wells used for emergency purposes only;

(5) permits to appropriate 15 acre-feet of water or less per year that are exempt pursuant to K.A.R. 5-25-15;

(6) term permit applications of one year or less and those term applications meeting the requirements of K.A.R. 5-25-13;

(7) permits to appropriate water from a bedrock aquifer;

(8) permits to appropriate water from the Dakota aquifer if the applicant can show either of the following:

(A) No Pleistocene aquifer exists within 5,280 feet of the proposed well location; or

(B) there is a significant difference in hydraulic head between the Pleistocene aquifer and the Dakota aquifer; and

(9) an application that proposes to use water in a manner so that there is no significant consumptive use of the local source of supply either in quantity or availability of water for use by other appropriators.

(c)(1) For each application for a change in the point of diversion, if the diversion works have not been completed, the application shall be exempt from the closure to new appropriations set forth in subsection (a). However, the proposed appropriation, when added to the vested rights, prior appropriation rights, earlier priority applications, term permits for more than a year, and all baseflow node allocations within a two-mile-radius circle whose center is the location of the proposed well, shall not exceed 1,500 acre-feet. It shall be assumed for purposes of analysis that all prior applications, permits, certificates, and vested rights are being fully exercised and that all limitation clauses listed on permits and certificates are in force.

(2) If part of the area within the two-mile-radius

circle around the proposed well location is outside the district boundaries, the 1,500 acre-feet quantity of water referred to above in paragraph (c)(1) shall be reduced proportionately by the percentage of the circle lying outside of the district boundaries. Only the baseflow node allocations, vested rights, prior appropriations, earlier priority applications, and term permits for more than one year ascribed to wells within the portion of the circle within the district shall be considered.

(3) If all of the wells authorized under a vested right or an application are not included inside the circumference of the circle, then a reasonable quantity shall be allocated to each well based upon the best available information.

(4) Each analysis for an application for a change in the point of diversion referred to in subsection (c) shall include all applications with a priority earlier than the priority established by the filing of the application for change. (Authorized by K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-1028; implementing K.S.A. 82a-706, K.S.A. 82a-706a, K.S.A. 2002 Supp. 82a-708b, and K.S.A. 2002 Supp. 82a-1028; effective May 1, 1980; amended May 1, 1981; amended, T-86-4, March 22, 1985; amended May 1, 1986; amended May 1, 1987; amended May 1, 1988; amended April 19, 1996; amended March 16, 2001; amended Oct. 31, 2003.)

5-25-5. Well equipment. (a) Each non-domestic well, except any well authorized by a temporary permit, shall be equipped with a water flowmeter that meets or exceeds the requirements of subsection (c).

Each non-domestic, non-temporary well not subject to regulation under the Kansas chemigation safety law, K.S.A. 2-3301 et seq. and amendments thereto, shall be equipped with an in-line, automatic, quick-closing check valve capable of preventing pollution of the source of water supply.

(b) Each check valve installed shall meet or exceed the specifications set forth in K.A.R. 5-6-13a.

(c) Each water flowmeter required by the board, or pursuant to a regulation adopted by the chief engineer, before the effective date of this regulation, shall meet or exceed applicable requirements of article 1 of the division's regulations. (Authorized by K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-1028; implementing K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-1028; effective May 1, 1980; amended May 1, 1985; amended April 19, 1996; amended Oct. 31, 2003.)

5-25-6. Reporting water use. Each water right owner shall report to the board the readings of water meters, gauges and other measuring devices at such times as may be required by the board. (Authorized by K.S.A. 82a-706a and K.S.A. 82a-1028(o); implementing K.S.A. 82a-1028(l); effective May 1, 1980; amended April 19, 1996.)

5-25-7. Water quality tests. Each water right owner shall take water samples from the owner's wells and have water quality analyses made on those samples at the owner's expense at times specified by the board. A laboratory licensed by the Kansas department of health and environment shall conduct the water quality analyses. The type of water quality analyses conducted shall be specified by the board. The owner shall submit the results of the water quality analyses to the board. (Authorized by K.S.A. 82a-706a and K.S.A. 82a-1028(o); implementing K.S.A. 82a-1028(k); effective May 1, 1980; amended April 19, 1996.)

5-25-8. Waste of water. A person shall not commit or allow a waste of water as defined in K.A.R. 5-1-1. (Authorized by K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-1028; implementing K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-1028; effective May 1, 1980; amended April 19, 1996; amended Oct. 31, 2003.)

5-25-9. Procedures for non-compliance with rules and regulations. (a) The district's board or manager, any eligible voter or any person 18 years or older residing within the district may file a written complaint with the district alleging a violation of these rules and regulations, the management program, the groundwater management district act or the Kansas water appropriation act, as amended. The written complaint shall be filed at the district office.

(b) Within 30 days following the filing of the complaint, a representative of the district designated by the board shall investigate the complaint. If the representative of the district finds that a violation exists or did exist, the representative shall issue a written directive to the violator to come into compliance with the applicable rules and regulations, management program and laws, within a reasonable period of time.

(c) If the violator fails to comply with the directive of the representative within a reasonable period of time as determined by the board, the district may:

(1) seek to enjoin the violator's use of water by

suitable action in district court until such time as the violator complies;

(2) seek the assistance of the chief engineer and attorney general of the state of Kansas to enjoin the violator's use of water until such time as the violator complies; or

(3) pursue other courses of action in the public interest. (Authorized by K.S.A. 82a-706a and K.S.A. 82a-1028(o); implementing K.S.A. 82a-1028(n); effective May 1, 1980; amended May 1, 1981; amended April 19, 1996.)

5-25-10. Test holes and water quality analyses. (a) Except for those types of applications described in K.A.R. 5-25-4(b), each applicant proposing to divert groundwater for non-domestic use within the district shall drill a test hole that shall meet the following requirements:

(1) Be drilled within 20 feet of the proposed well to the bottom of the aquifer;

(2) be completed as an observation well according to the following specifications:

(A) A casing made of schedule 80 PVC with a minimum outside diameter of three inches shall be used;

(B) five feet of well screen shall be installed at the base of the usable aquifer;

(C) the annular space shall be grouted with neat cement from the top of the well screen to the land surface; and

(D) centralizers shall be placed on the casing at intervals of not greater than 40 feet starting at the bottom of the casing; and

(3) be drilled under the supervision of the district.

(b) Each applicant shall have a water sample taken from within five feet of the bottom of the aquifer and shall have the water sample analyzed for chloride content by a laboratory certified by the Kansas department of health and environment. The applicant shall furnish the results of the water quality analysis and a copy of the test hole log to the district.

(c) If the analysis of the water sample taken within five feet of the bottom of the aquifer indicates that the chloride content exceeds 500 milligrams per liter (mg/l), the application to appropriate water shall be recommended for denial by the district unless both of the following conditions are met:

(1) The applicant shows that approval of the application will not cause an unreasonable deterioration of the water quality nor prejudicially and unreasonably affect the public interest.

(2) The applicant desires to proceed and is willing, at the applicant's expense, to drill and complete at least two additional observation wells at locations to be determined by the district based on the lithology and the construction of the proposed well. Both of these two additional observation wells shall be constructed according to specifications adopted by the district and in the presence of a representative of the district. The two additional observation wells shall be constructed and screened above the saltwater and freshwater interface at a depth specified by the district. If the proposed point of diversion is to be a well battery, the number and location of the test holes and observation wells required shall be determined by the district based on the best hydrogeologic information available, including groundwater flow direction, lithology, and chloride levels.

(d) If at any time the chloride concentration in either of the latter two observation wells exceeds 500 mg/l, the owner shall reduce the instantaneous rate of pumping or the annual quantity pumped, or both, as necessary to reduce the chloride concentration in both observation wells to below 500 mg/l.

(e) The permit shall be dismissed and the owner shall properly plug the well at the owner's expense if either of the following occurs:

(1) Within one year after the chloride concentrations exceed 500 mg/l in either of the two observation wells, the chloride concentrations are not reduced below 500 mg/l.

(2) Operation of the well causes impairment of any other water right, including a domestic water right. (Authorized by K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-1028; implementing K.S.A. 82a-706a, and K.S.A. 2002 Supp. 82a-1028; effective May 1, 1983; amended April 19, 1996; amended Oct. 31, 2003.)

5-25-11. Determination of well locations. If a question arises as to where a well is located, the burden of proof shall remain upon the applicant to show the actual location of the well in question. (Authorized by K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-1028; implementing K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-1028; effective May 1, 1983; amended Oct. 31, 2003.)

5-25-12. Approval of application for additional rate only. Each application for a permit to appropriate water for beneficial use that re-

quests only an increase in the authorized rate of diversion, and no net increase in maximum annual quantity, from a specific point of diversion already authorized by another water right or approval of application shall be exempt from meeting the requirements of K.A.R. 5-25-4 if the application meets the requirements of K.A.R. 5-4-5. (Authorized by K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-1028; implementing K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-1028; effective Oct. 31, 2003.)

5-25-13. Term permits. The approval of an application, or an extension of a term permit, for more than one year may be granted only if one of the following conditions is met:

(a) The term permit authorizes the use of contaminated water. For the purpose of this regulation, water containing chlorides in excess of 1,000 milligrams per liter (mg/l) shall be considered to be contaminated. For other types of contamination, the level of contamination at which an application may be approved in accordance with this regulation shall be based on the best information available.

(b) The term permit authorizes the use of water for aquifer remediation.

(c) The term permit authorizes hydraulic dredging.

(d) The applicant demonstrates that approval of an extension of the expiration date of a term permit for more than one year will neither impair a use under an existing water right or approval of application nor prejudicially and unreasonably affect the public interest. (Authorized by K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-1028; implementing K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-1028; effective Oct. 31, 2003.)

5-25-14. Battery of wells. (a) An application for a change in point of diversion to convert one well to a battery of wells, as defined in K.A.R. 5-1-1, shall not be considered for approval unless all of the criteria in paragraph (a)(1), (2), or (3) below are met:

(1)(A) The proposed battery of wells meets the definition of a battery of wells as defined in K.A.R. 5-1-1.

(B) The time to construct the diversion works has not expired.

(C) The proposed rate of diversion does not exceed the currently authorized rate of diversion.

(2)(A) The proposed battery of wells meets the definition of a battery of wells as defined in K.A.R. 5-1-1.

(B) Water is available for appropriation at the geocenter of the proposed well battery based on the criteria set forth in K.A.R. 5-25-4(c).

(C) The proposed rate of diversion does not exceed the currently authorized rate of diversion.

(3)(A) The proposed battery of wells meets the definition of a battery of wells as defined in K.A.R. 5-1-1.

(B) A certificate of appropriation has been issued pursuant to K.S.A. 82a-714 and amendments thereto.

(C) The maximum instantaneous rate of diversion approved shall be either of the following:

(i) The maximum instantaneous rate of diversion under normal operating conditions actually used during any of the three consecutive calendar years before the date of the application for change; or

(ii) the tested rate of diversion achieved under actual operating conditions made by a tester approved by the chief engineer. The test of the rate of diversion shall be made within six months either before or after the change application is filed.

(D) The proposed rate of diversion does not exceed the currently authorized rate of diversion.

(b) In addition to meeting the requirements specified in subsection (a), the applicant shall also demonstrate that approval of the battery of wells will not impair existing water rights or approvals of applications and will not prejudicially and unreasonably affect the public interest.

(c) Each permit shall also be conditioned by the chief engineer so that the permit is subject to K.A.R. 5-25-2a (b) and (c). (Authorized by K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-1028; implementing K.S.A. 82a-706, K.S.A. 82a-706a, K.S.A. 2002 Supp. 82a-706b, and K.S.A. 2002 Supp. 82a-1028; effective Oct. 31, 2003.)

5-25-15. Exemptions for up to 15 acre-feet of groundwater. Except as specified in subsection (b), an application to appropriate groundwater for up to 15 acre-feet of water shall be approved if all of the criteria in subsection (a) are met:

(a) (1) The sum of the annual quantity of water requested by the new application and the total annual quantities authorized by prior approvals of

applications because of an exemption pursuant to this regulation does not exceed 15 acre-feet in a ½-mile-radius circle surrounding the proposed point of diversion.

(2) The proposed well meets the well spacing criteria set forth in K.A.R. 5-25-2.

(3) The approval of application will not authorize an additional quantity of water out of an existing authorized well with a non-domestic permit or water right that would result in a total combined annual quantity of water authorized from that well in excess of 15 acre-feet.

(4) The applicant demonstrates that approval of up to 15 acre-feet of water will not impair existing water rights or approvals of applications and will not prejudicially and unreasonably affect the public interest.

(5) All other criteria for processing a new application to appropriate water have been met.

(b) Exemptions to approve a new application to appropriate water in accordance with this regulation shall not be approved if the exemption would conflict with one of the following:

(1) The provisions of an intensive groundwater use control area order issued by the chief engineer pursuant to K.S.A. 82a-1036 through K.S.A. 82a-1040, and amendments thereto; or

(2) the implementation of a water right purchase program in the Rattlesnake creek basin in both of the following:

(A) The corridor; and

(B) the number two priority area as shown in figure two of the Rattlesnake creek management plan accepted by the chief engineer on July 11, 2000.

(c) After the use of up to 15 acre-feet has been approved pursuant to this regulation, no application for change shall be approved for that quantity of water that would authorize that water to be diverted from another authorized point of diversion.

(d) An application approved as an exemption under this regulation shall not be leased or placed in a water bank so that it can be diverted at another location. (Authorized by K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-1028; implementing K.S.A. 82a-706, K.S.A. 82a-706a, K.S.A. 2002 Supp. 82a-711, and K.S.A. 2002 Supp. 82a-1028; effective Oct. 31, 2003.)

5-25-16. Water quality analyses and observation wells in the Rattlesnake creek subbasin. Groundwater rights that have points of diversion located in the Rattlesnake creek subbasin east and north of federal highways US-281 and US-50 shall be subject to the following requirements: (a) The water right owner, or the authorized representative, shall test water samples to determine, as needed, whether the water being pumped contains more than 300 milligrams of chlorides per liter. The district may require the tests to be made at a frequency not to exceed once in 365 days.

All water quality samples shall be taken in the presence of an authorized representative of the district, and one-half of the sample shall be given to the authorized representative of the district when the sample is taken. The owner shall have the water sample analyzed for chloride content by a laboratory certified by the Kansas department of health and environment. The applicant shall furnish the results of the water quality analysis to the district within 60 days after the date the sample was taken.

(b) If the analysis of the water sample taken indicates that the chloride content exceeds 300 milligrams of chlorides per liter, the owner shall be required, before any approval of a change in point of diversion, to drill an observation well to bedrock in the manner specified in K.A.R. 5-25-10(a). (Authorized by K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-1028; implementing K.S.A. 82a-706, K.S.A. 82a-706a, K.S.A. 2002 Supp. 82a-708b, and K.S.A. 2002 Supp. 82a-1028; effective Oct. 31, 2003.)

5-25-17. Voluntary reductions of water rights in the Rattlesnake creek subbasin. Each water right owner in the Rattlesnake creek subbasin that agrees to meet, and does meet, all of the conditions specified in subsections (a) through (e) no later than March 31, 2004 on a water right for a center pivot irrigation system with a priority date on or before April 12, 1984 shall receive a credit toward any reduction required by alternative management actions implemented in accordance with the Rattlesnake creek basin management program accepted by the chief engineer on July 11, 2000. The amount of the credit shall be calculated by multiplying by 1.5 the total number of years that the water right has been voluntarily reduced in accordance with the terms of this regulation before any alternative actions are taken under this program times the quantity of water that was voluntarily reduced. Water right

owners who have taken a reduction in their water right under this regulation shall have any further reduction through the Rattlesnake creek basin management program based on the authorized amount before a voluntary reduction is made under this regulation.

(a) The owner permanently reduces the maximum number of acres actually irrigated in any one calendar year during the period 1987 through 1996 by the number of acres previously watered by the end gun and provides documentation to the chief engineer of the number and location of the acres irrigated by the end gun during the period 1987 through 1996.

(b) The owner removes the end gun from the center pivot and certifies to the chief engineer what type of end gun has been removed.

(c) The owner installs pressure regulators on the center pivot to prevent the same rate of diversion from being pumped after the end gun is removed as was pumped before the end gun was removed and certifies to the chief engineer what pressure regulators have been installed.

(d) The chief engineer permanently reduces the authorized place of use of that water right by the maximum number of acres actually irrigated in any one calendar year by the end gun during the period 1987 through 1996.

(e) The chief engineer permanently reduces the maximum annual quantity authorized by that water right by the quantity of water that is calculated by multiplying the number of acres previously watered by the end gun times the net irrigation requirements (NIR) for the 50 percent chance rainfall for the county in which the point of diversion is located, as set forth in K.A.R. 5-5-12. (Authorized by K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-1028; implementing K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-1028; effective Oct. 31, 2003.)

5-25-18. Changes of well locations within the Rattlesnake creek basin. (a) Each application to change the location of a well within the Rattlesnake creek basin by more than 2,640 feet may be approved by the chief engineer if all of the following conditions are met:

(1) The source of water supply for the currently authorized well and the proposed well is the Rattlesnake creek basin as defined in K.A.R. 5-6-15.

(2) The currently authorized well is located within the corridor or the number two priority decline area as defined in figure two of the Rattlesnake creek management plan accepted by the chief engineer on July 11, 2000.

(3) The well will be moved to a location outside the corridor or the number two priority decline area as defined in figure two of the Rattlesnake creek management plan accepted by the chief engineer on July 11, 2000.

(4) The average saturated thickness in the two-mile-radius circle in which the proposed well will be located is greater than 40 feet as shown on the saturated thickness map adopted by reference in K.A.R. 5-25-19.

(5) The water level within the two-mile-radius circle surrounding the proposed well location has not declined in excess of 20 feet of the predevelopment water level as shown in Kansas geological survey bulletins numbered 65, 80, and 88.

(6) The change proposes the relocation of all the water right or a divided water right.

(7) No other well has previously been authorized by the chief engineer to be relocated within a one-mile radius of the proposed well location under the provisions of this regulation, or the applicant demonstrates that the proposed well will not impair existing water rights.

(8) The water right that is proposed to be changed is vested or certified.

(9) All other statutory and regulatory requirements for approval of a change in point of diversion that do not conflict with this regulation are met.

(b) The approval of the change in point of diversion shall be subject to the conditions specified in this subsection:

The approval of the application to change the point of diversion shall be subject to review by the chief engineer 10 years after the approval of the change application. If the water level at the new well location has declined in excess of 10 feet from the date the new well was drilled, for the sole purpose of administering wells concerning direct impairment, the new well shall be considered to have the priority of the date of the application to change the point of diversion. The owner of the well shall have the option of applying for another change in point of diversion.

(c) The quantity of water that can be approved for a change in point of diversion meeting the requirements of subsection (a) above shall be determined based on the following tables.

Points

point value for each column at right	saturated thickness at proposed well site, in feet	quantity of water authorized in two-mile-radius circle around proposed well, in acre-feet	feet of decline in two-mile-radius circle around proposed well since pre-development
1	146+	0-1,500	0-4
2	111-145	1,501-3,000	5-8
3	91-110	3,001-4,500	9-12
4	66-90	4,501-6,000	13-16
5	41- 65	6,001+	17-20

Percent of a water right that can be moved to a new location

number of points scored by proposed well	percent of water right that can be moved to new well location
3-6	100
7-9	90
10-12	80
13-15	70

(Authorized by K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-1028; implementing K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-1028; effective Oct. 31, 2003.)

5-25-19. Saturated thickness map. (a) The following electronic data files, all dated July 10, 2002 and prepared by the district using data developed by the Kansas geological survey and the district, are hereby adopted by reference by the chief engineer:

(1) Rattlesnake basin.dbf;
(2) Rattlesnake basin.sbn;
(3) Rattlesnake basin.sbx;
(4) Rattlesnake basin.shp;
(5) Rattlesnake basin.shx; and
(6) Wln.dbf.

(b) Except as set forth in subsection (c), the electronic data files described in subsection (a) shall be used in all situations in which determination of the saturated thickness of the aquifer within the boundaries of the district is necessary.

(c) The saturated thickness shown in the electronic data files shall be used unless the applicant provides, or the chief engineer has available, better or more site-specific data concerning the actual saturated thickness of the two-mile-radius circle surrounding the well in question. (Authorized by K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-1028; implementing K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-1028; effective Oct. 31, 2003.)

5-25-20. Recommendations by the board. (a) The following types of applications shall be submitted by the chief engineer to the district for review and recommendation:

(1) All applications to appropriate water for beneficial use, except for temporary use and domestic use; and

(2) all applications to change the point of diversion, place of use, the use made of the water, or any combination thereof, except applications to move the point of diversion less than 300 feet.

(b) The district shall conduct a review of the proposed application. Except as set forth in subsection (d), the district's recommendation to the chief engineer shall be consistent with the provisions of the Kansas water appropriation act, the groundwater management district act, and the regulations adopted by the chief engineer pursuant to those acts.

(c) Within 15 working days after the date the chief engineer submits the application to the district for review, or within any extension of time authorized by the chief engineer, the district shall submit its findings and recommendation for approval, denial, or modification of the application and shall specify the basis for the recommendation.

(d) The district may submit to the chief engineer a written recommendation of an exemption from or a waiver of a regulation. If the district submits such a recommendation, the district shall demonstrate to the chief engineer that the granting of the proposed waiver or exemption will not prejudicially and unreasonably affect the public interest and will not cause impairment of any existing water right. (Authorized by K.S.A. 82a-706a and K.S.A. 2002 Supp. 82a-1028; implementing K.S.A. 82a-706, K.S.A. 82a-706a, and K.S.A. 2002 Supp. 82a-711; effective Oct. 31, 2003.)

Articles 26 to 29.—RESERVED

Article 30.—DAMS

5-30-1. Approval of or permits for dams. The chief engineer shall not approve or grant a permit for any dam subject to the jurisdiction of the chief engineer under the authority of K.S.A. 1979 Supp. 82a-301 through 305a as amended, unless the applicant also receives prior approval

of his or her application to appropriate water for beneficial use to be diverted by means of the dam for which the approval or permit is sought, unless the sole proposed use for the water is for domestic use. (Authorized by K.S.A. 82a-706a, 82a-709; effective May 1, 1980.)

Articles 31 to 39.—RESERVED

Article 40.—DESIGN OF EARTH DAMS

5-40-1. Definitions. As used in K.S.A. 82a-301 through 82a-305a and amendments thereto, in the regulations adopted pursuant thereto, and by the division of water resources in administering K.S.A. 82a-301 through 82a-305a and amendments thereto, unless the context clearly requires otherwise, the following words and phrases shall have the meaning ascribed to them in this regulation: (a) "Application" means the formal document submitted to the chief engineer requesting a permit, in accordance with the provisions of K.S.A. 82a-301 through 82a-305a and amendments thereto, that authorizes the applicant to proceed with the construction of a proposed dam, channel change, or stream obstruction.

(b) "Authorized representative" means any staff employee designated by the chief engineer to perform duties and functions on behalf of the chief engineer.

(c) "Channel change or stream obstruction" means any project or structure, including any dam, that meets either of the following criteria:

(1) Does not extend above the higher natural bank; or

(2) alters the course, current, or cross section of any stream of the state.

(d) "Chief engineer" means the chief engineer, division of water resources of the Kansas department of agriculture.

(e) "Dam" means any artificial barrier, together with appurtenant works, that does, or may, impound water.

(f) "Freeboard" means the vertical distance between the maximum stage attained in the design storm event and the top of the structure.

(g) "Navigable stream" means the Arkansas river, the Missouri river, and the Kansas river.

(h) "Perennial stream" means a stream, or part of a stream, that flows continuously during all of the calendar year, except during an extreme drought.

(i) "Permit" means the formal document that is issued by the chief engineer to the sponsor of a project and that authorizes the sponsor to proceed with the construction of the dam, channel change, or stream obstruction.

(j) "Reservoir" means the area upstream from a dam that contains, or will contain, impounded water.

(k) "Stream" means any watercourse that has a well-defined bed and banks, and that has a watershed above the geographic point in question that exceeds the following number of acres:

(1) Zone three: 640 acres for all geographic points within any county west of a line formed by the adjoining eastern boundaries of Phillips, Rooks, Ellis, Rush, Pawnee, Edwards, Kiowa, and Comanche counties;

(2) zone two: 320 acres for all geographic points within any county located east of zone three and west of a line formed by the adjoining eastern boundaries of Republic, Cloud, Ottawa, Saline, McPherson, Reno, Kingman, and Harper counties; and

(3) zone one: 240 acres for all geographic points within any county located east of zone two. The stream need not flow continuously and may flow only briefly after a rain in the watershed. If the site of the project has been altered so that a determination of whether the well-defined bed and banks exist is not possible, it shall be presumed that they did exist if the watershed acreage criteria have been met, unless the owner of the project can conclusively demonstrate that the well-defined bed and banks did not exist before the construction of the project.

(l) "Watershed" means all of the area draining toward a selected point on a stream. (Authorized by K.S.A. 82a-303a; implementing K.S.A. 82a-302; effective May 1, 1983; amended May 1, 1987; amended, T-5-12-30-91, Dec. 30, 1991; amended Feb. 17, 1992; amended Sept. 22, 2000.)

5-40-2. Dams; plans and specifications. Plans for dams shall include: (a) Plan view of dam and dam site. The plan view of the dam and dam site may be shown in connection with the topographic map of the reservoir basin, providing the scale is sufficiently large to show adequate detail. A separate plan view shall be used if necessary to clearly show the features of the entire area in which the dam and spillway are to be located, and the details required below. The area covered by this view shall be on both abutments of the dam as well as a considerable distance both upstream

and downstream from the dam. All elevations shown on plans shall be referred to permanent bench marks described on the plans. The following details shall be shown:

(1) Location of the axis of the dam, showing stationing and top width limits;

(2) toe of upstream and downstream slopes;

(3) location of center line and limits of emergency spillway;

(4) location of principal spillway and any stilling basin;

(5) location of berms;

(6) location of slope protection;

(7) location of borings or test holes and test pits;

(8) location of intakes, outlets, valves and valve wells;

(9) location, description and elevation of permanent bench marks; and

(10) location, description and details of all foundation drains;

(b) Map of drainage pattern above and below the dam site. A map, to a scale no smaller than one inch to 2,000 feet, shall show the location of the watercourse across which the dam is to be built and its tributaries above the dam site. The following shall also be shown: (1) The location of the dam and the outline of the reservoir;

(2) the boundary of the watershed, shown by a line enclosing the entire area that will drain into the reservoir;

(3) section lines, with sections properly identified;

(4) size of the drainage area;

(5) the land owned by the sponsor; and

(6) roads, railroads, pipeline crossings and any other prominent features in the vicinity. The point where the axis of the dam crosses the stream shall be shown on this map by showing distances and angles from an apparent section corner or quarter corner. It shall be acceptable to utilize an aerial photograph to make this determination;

(c) Topographic map of the reservoir basin. A topographic map of the dam site and reservoir area shall be shown to the following scale:

Surface areas at top of dam	Acceptable scale
less than 30 acres	one inch to 100 feet
30 acres through 100 acres	one inch to 200 feet
more than 100 acres	one inch to 300 feet

The location of the dam shall be superimposed on this map. Topography shall be shown by contours at two foot intervals. For dams more than 20 feet in height, contours may be spaced at greater intervals, but shall not exceed five feet. In addition, contours equivalent to the elevation of the lowest uncontrolled opening (permanent pool), elevation of the crest of the emergency spillway, and elevation of the top of the dam shall be shown. The elevation of each contour shall be clearly noted on the map;

(d) Cross section of dam site and longitudinal section of dam. The cross section of the valley at the dam site shall be taken along the axis of the dam. A separate cross section view shall be used if necessary to clearly show the details required below. The details on this section shall include the following:

(1) Elevation to which the top of the dam is to be maintained and the elevation to which it is to be initially constructed in order to provide an adequate settlement allowance;

(2) elevation of the stream bed;

(3) location and elevation of the crest of the emergency spillway;

(4) location and elevation of the crest of the principal spillway;

(5) elevation of any berms;

(6) original surface of the ground;

(7) proposed elevations and dimensions of cutoff trench;

(8) location and elevation of outlet works;

(9) location of test holes showing materials encountered in the section; and

(10) location, description and elevations of all foundation drains;

(e) Cross section of dam. A cross section of the dam at the deepest point shall be shown. If the cross section is variable, a typical section shall be shown for each reach with proper description of the reach by stationing. Additional cross sections along the axis of the principal spillway and the axis of any other outlets shall be shown. Cross sections of the dam shall include the following:

(1) Elevation and width of the top of the dam;

(2) elevation and width of any berms;

(3) slopes of the upstream and downstream faces of the dam;

(4) elevation, location and type of slope protection;

(5) zones of earth embankment;

(6) dimensions to which the dam is to be constructed to provide an adequate allowance for settlement;

(7) elevation, location and dimensions of cutoff trench and core wall; and

(8) location of all foundation drains;

(f) Plan, profile, and cross section of emergency spillway. Details of the emergency spillway shall include the following:

(1) Plan view showing the location and stationing along the center line of the emergency spillway, together with the location of the control section and details of riprap or other slope and floor protection;

(2) sections showing elevations, slopes and dimensions of the spillway; and

(3) profile along the axis of the spillway, extending from the reservoir area through the control section to the stream bed below the dam. Stationing on the profile shall correspond to that on the plan view. This profile shall show the existing ground elevation, proposed grade of the bottom of the spillway, elevation of slope protection on the side slopes, and the nature of the material through which the spillway is excavated;

(g) Profile of principal spillway. Details of the principal spillway shall include the profile along the axis of the spillway, extending from the intake to the outlet, showing the size and spacing of the cutoff collars. This profile shall show existing ground elevations and the proposed grade of the spillway. Details of the stilling basin, supports and other features shall also be shown;

(h) Reservoir data. The number of acres enclosed by each contour within the reservoir basin and the total storage capacity of the reservoir in acre-feet at the elevation of each contour shall be determined and tabulated on the plan. The data shall be compiled for all contours in the reservoir up to the elevation of the top of the dam. Computations of capacity shall be based on the natural topography of the reservoir basin including the volume of any excavation in the reservoir below the emergency spillway made during construction of the dam. When the reservoir is divided between more than one landowner, the property lines shall be shown on the topographic map of the basin;

(i) Bench marks. At least two permanent bench marks shall be set for future reference conveniently located for use after construction. The bench marks shall be placed where they will not be destroyed or submerged after the reservoir fills, preferably, at a location along the axis of the dam near both dam extremities. A three or four foot length of pipe or steel driven flush with the ground in an area which is unlikely to be disturbed may be used. Wood or plastic stakes, nails, or marks in trees shall not be considered as permanent bench marks. The location and description of the bench marks shall be shown on the plans. They shall be properly referenced so that they can be easily found in the field. Elevations for size two, size three and size four structures shall be referenced to the national geodetic vertical datum of 1929 to a tolerance of plus or minus one half foot. Elevations for size one structures shall be referred to any assumed datum; and

(j) Spillway discharge capacity data. (1) A curve or table showing discharge capacity of the emergency spillway, in cubic feet per second, shall be developed and shown on the plan.

(2) A curve or table showing discharge capacity of the principal spillway, in cubic feet per second, shall be developed and shown on the plan.

(k) Each application for a permit to construct a class (c) high hazard dam shall include an emergency preparedness plan. (Authorized by K.S.A 82a-303a; implementing K.S.A. 82a-302; effective May 1, 1983; amended May 1, 1985; amended May 1, 1987.)

5-40-3. Specifications. The specifications for dams, channel changes and obstructions shall be prepared on 8½ by 11 inch sheets of a good grade of white bond paper. The specifications shall be in sufficient detail to assure that the works will be properly executed and shall comply with currently accepted engineering practices. The specifications shall include provisions for: (a) Adequate supervision during the period of construction by a person qualified to design the structure;

(b) notification of the division of water resources of the status of construction; and

(c) inspection by representatives of the division of water resources. (Authorized by K.S.A. 82a-303a; implementing K.S.A. 82a-302; effective May 1, 1983; amended May 1, 1987.)

5-40-4. Preparer of maps, plans, profiles, and specifications. In addition to the requirements of the Kansas board of technical professions, the requirements in this regulation shall apply. (a) Each map, plan, profile, and specification submitted to the chief engineer for approval shall be prepared by a person who is competent in the design and construction of dams, channel changes, or stream obstructions, as appropriate.

(b) Maps, plans, profiles, and specifications for any dam that meets one of the following criteria shall be prepared by a licensed professional en-

gineer who is competent in the design and construction of dams:

(1) Impounds 50 acre-feet or more at the top of the dam;

(2) is 25 feet or more in height; or

(3) is either a class (b) or class (c) hazard dam.

(c) Maps, plans, profiles, and specifications for any channel change or stream obstruction project on a navigable stream or a stream having a mean annual flow of 100 cubic feet per second or more at the proposed location of the project shall be prepared by a licensed professional engineer who is competent in the design of that type of project.

(d) No provision of this regulation, nor any decision made by the chief engineer pursuant to this regulation, shall alter the responsibilities or duties of any licensee of the Kansas board of technical professions to comply with that board's requirements. (Authorized by K.S.A. 82a- 303a; implementing K.S.A. 82a-302; effective May 1, 1983; amended May 1, 1986; amended May 1, 1987; amended Sept. 22, 2000.)

5-40-5. Determining capacity of reservoir. To determine whether a dam impounds 30 acre-feet of water, pursuant to K.S.A. 82a-304, that measurement shall be made at the lowest elevation of the top of the dam. (Authorized by K.S.A. 1982 Supp. 82a-303a; implementing K.S.A. 82a-302; effective May 1, 1983.)

5-40-6. Waiver and stricter requirements. (a) The chief engineer may waive any of the regulations adopted under articles 40, 41, 42 and 43 if it is shown to the satisfaction of the chief engineer that the waiver of the regulation will not pose a hazard to the public safety and that the waiver is in the public interest.

(b) The chief engineer may also invoke any jurisdiction granted by statute and impose stricter requirements than required by rules and regulations where such jurisdiction or additional requirements are necessary to protect the public interest, protect the public safety or prevent damage to property. (Authorized by K.S.A. 82a-303a; implementing K.S.A. 82a-303; effective May 1, 1983; amended May 1, 1987.)

5-40-7. Other maps, plans, profiles, data and specifications. The applicant shall also submit any other maps, plans, profiles and specifications of the dam, channel change or obstruction and any other data which the chief engineer may require. (Authorized by K.S.A. 82a-303a; implementing K.S.A. 82a-302; effective May 1, 1983; amended May 1, 1987.)

5-40-8. Application. The application shall be filed on the prescribed form or forms furnished by the chief engineer and shall be completed in proper form. (Authorized by K.S.A. 1982 Supp. 82a-303a; implementing K.S.A. 82a-302; effective May 1, 1983.)

5-40-9. Adoption by reference. All of "engineering guide-1" (eg-1), relating to earth dams, hazard classes, spillway requirements, detention storage requirements and rainfall data, as revised May 1, 1986, by the Kansas state board of agriculture, division of water resources, is hereby adopted by reference and shall apply to dams constructed in this state. (Authorized by K.S.A. 82a-303a; implementing K.S.A. 82a-302; effective May 1, 1983; amended May 1, 1985; amended May 1, 1986.)

5-40-10. Adoption by reference. All of "engineering guide-2" (eg-2), relating to administrative requirements and criteria for the design of earth dams, as revised May 1, 1986, by the Kansas state board of agriculture, division of water resources, is hereby adopted by reference and shall apply to dams constructed or modified in this state. (Authorized by K.S.A. 82a-303a; implementing K.S.A. 82a-302; effective May 1, 1984; amended May 1, 1985; amended May 1, 1986.)

5-40-11. Alternative requirements for approval to construct a dam. Construction or modification of a dam shall be approved by the chief engineer with any permit conditions necessary to protect life, property, and public safety if both of the following conditions are met:

(a) The applicant applies for prior written consent or a permit to build or modify a dam.

(b) The proposed dam or modification of a dam does not meet one or more of the hydrologic and engineering requirements of K.A.R. 5-40-9 and K.A.R. 5-40-10, but the applicant demonstrates to the chief engineer, based on sound hydrologic and engineering principles, that the proposed dam, or modification of a dam, will not endanger life, property, and public safety if it is constructed or modified in accordance with the submitted plans and specifications. (Authorized by K.S.A. 82a-303a; implementing K.S.A. 82a-302 and 82a-303; effective Sept. 22, 2000.)

5-40-12. As built drawings. Following

completion of all class (c) high hazard dams, within 90 days, or within any authorized extension of time, the applicant shall submit as built drawings prepared by a person authorized to prepare the original plans and specifications pursuant to K.A.R. 5-40-4. (Authorized by K.S.A. 82a-303a; implementing K.S.A. 82a-303; effective May 1, 1987.)

5-40-13. Safety inspections. Following the completion of construction of any class (c) high hazard dam, the owner shall have a dam safety inspection conducted by a licensed professional engineer and have the report submitted to the division of water resources. Inspections shall be conducted at five-year intervals, or more frequently if specifically requested by the chief engineer. (Authorized by K.S.A. 82a-303a; implementing K.S.A. 82a-303; effective May 1, 1987.)

5-40-14. Testing a principal spillway pipe installation in a dam; applicability. (a) For the purpose of testing the leakage rate of principal spillway pipe installation in a dam, an applicant shall conduct a static pressure test of each principal spillway installation constructed of corrugated metal pipe.

(b) A static pressure test shall be required only of a principal spillway installation made of corrugated metal pipe, unless the chief engineer determines that testing principal spillway pipe made of other materials or testing other pipes used in the construction of dams is necessary to protect public safety, life, or property. (Authorized by K.S.A. 82a-303a; implementing K.S.A. 82a-303b; effective Sept. 22, 2000.)

5-40-15. Testing a principal spillway pipe installation in a dam; general procedures. The following general procedures shall apply to all static pressure tests required by K.A.R. 5-40-14: (a) The applicant shall conduct the test before backfilling around and over the principal spillway pipe and after laying the pipe on the grade line and connecting the pipe according to the approved plans and the manufacturer's requirements.

(b) The applicant, the applicant's representative, or the contracting officer shall make arrangements for the chief engineer, or a person designated by the chief engineer, to be present during the test.

(c) The applicant shall place a watertight plug in the downstream end of the pipe. The plug shall be sufficient to withstand a pressure of three pounds per square inch for the duration of the test. The plug shall be equipped with an acceptable means of draining the water out of the pipe after completion of the test.

(d) The applicant shall fill the pipe with water up to an elevation of 10 feet above the flow line at the pipe outlet, or up to the principal spillway inlet elevation, whichever is less, unless a different elevation is required by the test method described in K.A.R. 5-40-16(b).

(e) The applicant shall note the exact elevation of the water surface at the time the test begins. At the end of the prescribed test duration, the applicant shall measure the water surface elevation.

(f) The applicant shall use one of the test methods described in K.A.R. 5-40-16 to determine whether the water leakage rate is acceptable.

(g) If the leakage rate determined by either of the methods described in K.A.R. 5-40-16 is not acceptable, the applicant shall determine the source of the leakage and correct the leakage. After correction, the applicant shall perform another test in accordance with K.A.R. 5-40-15 and K.A.R. 5-40-16.

(h) If the leakage rate determined by either of the methods described in K.A.R. 5-40-16 is acceptable, the applicant shall drain and backfill the pipe in the manner prescribed by the approved plans and specifications. (Authorized by K.S.A. 82a-303a; implementing K.S.A. 82a-303b; effective Sept. 22, 2000.)

5-40-16. Testing a principal spillway pipe installation in a dam; allowable leakage rate, test methods. The allowable leakage rate for a principal spillway pipe installation in a dam shall not exceed 1,000 gallons per inch diameter of pipe per mile of pipe per day. The applicant shall use one of the following test methods in determining whether the allowable leakage rate has been exceeded:

(a) The applicant shall use the following test method procedure for a drop inlet structure if the starting and ending elevation of the water is within the vertical drop structure and above the top of the barrel:

(1) Calculate the allowable leakage rate in gallons per minute for the pipe being tested based on the following formula:

The allowable leakage rate in gallons per minute = $0.000132 \times d \times l$ where:

d = diameter of the tested pipe in inches
l = length of the tested pipe in feet

If the allowable leakage rate in gallons per minute is determined to be less than one, then it shall be assumed for the purposes of the test that the allowable leakage rate in gallons per minute is one.

(2) Conduct the test for 15 minutes.

(3) If the allowable leakage rate is one gallon per minute, the applicant may use the following table to determine the allowable drop in the elevation of the water in the riser.

Nominal diameter of riser (inches)	Allowable drop (feet)
18	1.13
20	0.83
24	0.64
30	0.41
36	0.28

(4) If the measured drop in the riser exceeds the corresponding allowable drop in paragraph (a)(1) above, the allowable leakage rate has been exceeded, which shall not be acceptable. If the measured drop in the riser is less than or equal to the corresponding allowable drop in paragraph (a)(1) above, the allowable leakage rate has not been exceeded and shall be acceptable.

(b) The applicant shall use the following test method procedure for all other types of installations, including canopy inlets:

(1) If filling the pipe with water up to an elevation of 10 feet above the outlet puts water within the vertical riser below the top of the barrel, the elevation shall be reduced below the bottom of the vertical riser before the test begins.

(2) The allowable drop in elevation is a function of the allowable leakage rate, test duration, and the diameter and slope of the pipe. The allowable drop in the pipe in feet shall be calculated by use of the following formula:

$$\frac{\text{allowable rate (gallons per minute)} \times \text{test duration (minutes)} \times \text{slope (\%)}}{[\text{diameter (inches)}]^2 \times 4.08}$$

(3) The minimum test duration shall be 15 minutes. If the above formula results in an allowable drop of less than 0.1 foot in 15 minutes, the test duration shall be extended so that the allowable drop is greater than 0.1 feet.

(4) The water surface elevation drop shall be measured by means of a clear plastic tube installed in the plug at the downstream end of the principal spillway pipe. Any other means of measuring the drop in elevation shall be approved by the chief engineer in advance of the test.

(5) If the measured drop is greater than the allowable drop as calculated in paragraph (b)(2), the allowable leakage rate has been exceeded, which shall not be acceptable. If the allowable drop is less than or equal to the allowable drop as calculated in paragraph (b)(2), the allowable leakage rate has not been exceeded, which shall be acceptable. (Authorized by K.S.A. 82a-303a; implementing K.S.A. 82a-303b; effective Sept. 22, 2000.)

Article 41.—DESIGN OF CHANNEL CHANGES

5-41-1. Channel changes; plans and specifications. Plans for a channel change shall include the following: (a) A general location map or aerial photograph, showing the present alignment of the stream, location of the proposed channel change, section lines, property lines with names and addresses of adjoining landowners, drainage area, a north arrow, a bar scale, and any other prominent features;

(b) a detailed plan view of the project with stationing shown, including as many other views as necessary to fully describe the project;

(c) a profile drawing along the centerline of the proposed new channel. This profile shall extend five times the channel width upstream and an equivalent distance downstream from each end of the new channel. The stationing shown on the plan view shall correspond to stationing on the profile drawing. This drawing shall show the present ground surface, the present stream bed, and the grade line of the proposed new channel;

(d) cross sections of the existing stream at locations immediately above and below the proposed channel change. The location of these cross sections shall be described and shown on the plans. The elevations of the top of the existing banks and bottom of the channel shall be shown;

(e) at least one permanent bench mark conveniently located for use after construction, except for grassed waterways constructed for the purpose of conveying runoff without causing erosion or flooding. The location, description, and elevation of the permanent bench mark, to which all elevations are referred, shall be shown on the plans. The designer shall reference the project bench mark to the current national geodetic vertical datum, to a tolerance of plus or minus ½ foot on all channel

changes involving perennial streams and where detailed floodplain data are available. Project datum shall be acceptable on all other channel changes; and

(f) a cross-sectional drawing of the proposed new channel, including dimensions. (Authorized by K.S.A. 82a-303a; implementing K.S.A. 82a-302; effective May 1, 1987; amended Sept. 22, 2000.)

5-41-2. Channel changes; water velocity. The new channel shall have a conveyance capacity equal to or greater than the old channel. The water velocity after the completion of the proposed channel change or stream obstruction shall not exceed a permissive velocity. (Authorized by K.S.A. 82a-303a; implementing K.S.A. 82a-303; effective May 1, 1987.)

5-41-3. Channel changes; side slopes. The side slopes of the proposed new channel shall not be steeper than one foot vertical to two feet horizontal unless the applicant submits data and analysis to show that a steeper slope will be stable. (Authorized by K.S.A. 82a-303a; implementing K.S.A. 82a-303; effective May 1, 1987.)

5-41-4. Channel changes; construction by erosion. New channels shall not be constructed by erosion. (Authorized by K.S.A. 82a-303a; implementing K.S.A. 82a-303; effective May 1, 1987.)

5-41-5. Channel changes; disposal of excavated material. (a) Material removed from the newly excavated channel shall be deposited at a location and in a form acceptable to the chief engineer. If the material is to be deposited so that it will have the effect of a levee, a separate prior written approval of the chief engineer is required pursuant to K.S.A. 24-126.

(b) Filling or plugging the original channel shall receive the prior written approval of the chief engineer. (Authorized by K.S.A. 82a-303a; implementing K.S.A. 82a-303; effective May 1, 1987.)

5-41-6. Channel changes; vegetative strips on new channels. On each new channel project, except a grassed waterway constructed for the purpose of conveying runoff without causing erosion or flooding, a vegetative strip shall be established and maintained for a width of 50 feet immediately adjoining the channel on each side of the stream if site conditions permit, unless an acceptable engineering design shows that a greater or lesser width of vegetative strip is preferable. The general type of vegetation shall be approved by the chief engineer. (Authorized by K.S.A. 82a-303a; implementing K.S.A. 82a-303; effective May 1, 1987; amended Sept. 22, 2000.)

Article 42.—DESIGN OF STREAM OBSTRUCTIONS

5-42-1. Stream obstructions; plans and specifications. Plans for a stream obstruction shall include: (a) A general location map or aerial photograph showing the stream, location of the proposed obstruction, section lines, a bar scale, a north arrow, property lines with names and addresses of adjoining landowners, and any other landowners whose land may be hydraulically affected by the proposed stream obstruction, drainage area and any other prominent features;

(b) a detailed plan view fully describing the obstruction and the site;

(c) a profile showing the present elevation of the stream bed and both banks, extending upstream to the point where the stream bed elevation is equal to or higher than the top of the obstruction and extending downstream an equivalent distance from the project site;

(d) an elevation view showing the obstruction on a cross section of the stream and the valley up to the post project design flood elevation at the site;

(e) at least one permanent benchmark shall be conveniently located for use after construction. The location, description and elevation of the permanent benchmark, to which all elevations are referred, shall be shown on the plans. Reference to the national geodetic vertical datum of 1988, or other acceptable national vertical datum, to a tolerance of plus or minus one half foot is required for all stream obstructions on perennial streams and where detailed floodplain data are available. Project datum is acceptable on all other stream obstruction projects;

(f) details of the manner in which the obstruction is to be tied into the bed and banks of the streams;

(g) the land for which easements or rights-of-way are to be acquired if the proposed obstruction affects land other than that owned by the applicant; and

(h) unless it is clear that the impacts of the proposed project will be contained within the channel or limited to property under the control of the

applicant, a hydraulic analysis determining the pre-project and post-project water surface elevations for the two-year flood and the 100-year flood shall be prepared and submitted to the chief engineer. (Authorized by K.S.A. 82a-303a; implementing K.S.A. 82a-302; effective May 1, 1987; amended, T-5-12-30-91, Dec. 30, 1991; amended April 27, 1992.)

5-42-2. Stream obstruction; minor. If a proposed stream obstruction will not decrease the cross sectional area of a stream channel at the location of the obstruction by more than 15 percent, the plans required by the chief engineer shall be equivalent to the type submitted to the United States corps of engineers with applications for a department of the army permit. Such obstructions shall include weirs, causeways, low-water crossings, low-head dams, intake structures, boat launching ramps, pipeline crossings, outfall structures, marinas, boat docks, jetties and revetments. (Authorized by K.S.A. 82a-303a; implementing K.S.A. 82a-303; effective May 1, 1987.)

5-42-3. (Authorized by K.S.A. 82a-303a; implementing K.S.A. 82a-303; effective May 1, 1987; amended April 27, 1992; revoked Sept. 22, 2000.)

5-42-4. Stream obstruction; temporary structure. A temporary structure shall not require a stream obstruction permit from the chief engineer pursuant to K.S.A. 82a-301 et seq. and amendments thereto if it meets all of the following criteria:

(a) The structure is temporary in nature.

(b) The structure is constructed only of temporary materials, including local streambed materials, straw or hay bales, plastic, or plywood, that are likely to wash out during a bank-full storm event.

(c) The structure is actively maintained only during the duration of the temporary beneficial use.

(d) The structure is less than two feet in height above the natural bed of the stream, and alterations to the stream and alterations to the stream bank are no more than are necessary for permitting access to the site for operation and maintenance.

(e) The structure is below the natural low bank of the stream.

(f) Any water backed up by the structure is detained solely on property under the control of the landowner that constructed the temporary structure.

(g) The structure does not materially adversely affect the public interest, public safety, or environment. (Authorized by K.S.A. 82a-303a; implementing K.S.A. 82a-303; effective Sept. 22, 2000.)

Article 43.—SAND DREDGING PERMITS

5-43-1. Sand dredging operation; plans and specifications. Plans for a sand dredging operation from a stream shall include: (a) A general location map or aerial photograph showing the stream, location of the proposed sand dredging operation, section lines, property lines with names and addresses of adjoining landowners, local access roads, a bar scale, a north arrow and any other prominent features;

(b) a plat of the area within which the sand plant will be operated, prepared to a scale of 200 feet per inch, or less, if necessary to show in detail the features of the stream at the location. The plat shall include at least one permanent bench mark. The survey shall also include at least two permanent horizontal control points on a baseline running generally parallel to the stream. These permanent points shall be identified with substantial markers and shall be easily visible in the field. The plat shall show the location of the natural banks on both sides of the stream, all islands, sand bars, and the direction of the stream within the channel. Where county commissioners have established bank lines along a stream in accordance with the provisions of K.S.A. 82a-307a, the location of such established bank lines shall be shown. The plat shall also show the proposed location of the tipple, boundaries of areas from which material will be removed and the area to which rejected material will be returned;

(c) cross sections of the channel, measured along lines at right angles to the general direction of the stream and plotted to a horizontal scale of not more than 200 feet per inch and an appropriate vertical scale. Typical cross sections shall be shown for unobstructed portions of the channel as well as for portions in which islands, sand bars or other obstructions may be located. The elevation of the top of both banks, the bed of the stream, and the surface of islands and bars shall be shown on the cross sections. The location of lines along which cross sections are measured shall be referred to the baseline and indicated on the plat. All elevations shall be referred to a per-

manent bench mark, which is referenced to the national geodetic vertical datum of 1929 to a tolerance of plus or minus one half foot; and

(d) a statement of plan of operation. A brief paragraph shall be included explaining the plants usual operating plans. The kind of equipment, pumping capacities, seasonal limitations and any other operational constrictions shall be included. (Authorized by K.S.A. 82a-303a; implementing K.S.A. 82a-302; effective May 1, 1987.)

5-43-2. Sand dredging; buffer zone. There shall be a buffer zone of not less than 500 feet between dredging operations, and between dredging operations and all bridges. There shall be a buffer zone of 300 feet between dredging operations and buried pipeline or cable crossings. There shall be a buffer zone of 200 feet between dredging operations and levees, or other features subject to damage by undercutting. (Authorized by K.S.A. 82a-303a; implementing K.S.A. 82a-303; effective May 1, 1987.)

5-43-3. Sand dredging; operation. In counties at locations where bank lines have been established on designated streams pursuant to K.S.A. 82a-307, materials shall be removed only between established bank lines. The chief engineer, for good cause, may allow excavation or removal of material landward from established bank lines if approval is also obtained from the board of county commissioner. On navigable streams materials shall be removed only from the channel and in such a manner so as not to degrade the banks. On all other streams, materials shall be removed only from areas and in a manner approved by the chief engineer. (Authorized by K.S.A. 82a-303a; implementing K.S.A. 82a-303; effective May 1, 1987.)

5-43-4. Sand dredging; operations conflicting. If more than one operator proposes to operate within a given reach of a private stream, then all conflicting applicants shall be required to submit proof of easements or other legal authority to operate. If more than one operator proposes to operate within a given reach of a navigable stream, the chief engineer shall determine which operators shall be permitted, based on the following criteria: (a) The capability of the applicant's equipment to operate within the desired area;

(b) the applicant's need for the material;

(c) the applicant's existing operation, if any;

(d) the anticipated date the applicant will begin operation;

(e) the applicant's history of operation;

(f) the anticipated plant completion date;

(g) proof of the applicant's easements and right-of-ways necessary to operate;

(h) date of application; and

(i) any other relevant factor. (Authorized by K.S.A. 82a-303a; implementing K.S.A 82a-302; effective May 1, 1987.)

5-43-5. Sand dredging; operation setback. Sand dredging operations located outside the channel of a stream shall be set back a minimum of 50 feet from the bank of the channel. There shall be a minimum slope on the sand plant side of not greater than one foot vertical to four feet horizontal. (Authorized by K.S.A. 82a-303a; implementing K.S.A. 82a-303; effective May 1, 1987.)

Article 44.—FLOODPLAIN MANAGEMENT

5-44-1. Floodplain management; definitions. As used in these regulations, K.S.A. 12-766, and by the division of water resources in administering K.S.A. 12-766, unless the context clearly requires otherwise, the following words and phrases shall have the meaning ascribed to them in this section: (a) "Basement" means any area of a building having its floor subgrade (below ground level) on all sides.

(b) "Chief engineer" means the chief engineer of the division of water resources, Kansas state board of agriculture.

(c) "Development" means any man-made change to real estate, including, but not limited to:

(1) buildings or other structures;

(2) mining;

(3) dredging;

(4) filling;

(5) grading;

(6) paving;

(7) excavation or drilling; or

(8) storage of equipment or materials.

(d) "Flood or flooding" means a general and temporary condition of partial or complete inundation of normally dry land from:

(1) the overflow of waters normally confined between the banks of a stream or other watercourse, or

(2) the unusual, rapid accumulation or runoff of surface waters from any source.

(e) "Regulatory floodway" means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than one foot.

(f) "Lowest floor" means the lowest enclosed area, including a basement, of a building. An unfinished or flood resistant enclosure usable solely for parking of vehicles, building access or storage in an area other than a basement is not considered a building's lowest floor.

(g) "Permit" means a signed document from a designated community official authorizing development in a floodplain, including all necessary supporting documentation such as:

(1) the site plan;

(2) an elevation certificate; and

(3) any other necessary or applicable approvals or authorizations from local, state or federal authorities.

(h) "Structure" means a walled and roofed building, a manufactured house, or above ground gas or liquid storage tank.

(i) "Substantially improved" means any reconstruction, rehabilitation, addition to or other improvement of a structure, the cost of which equals or exceeds 50% of the market value of the structure before the improvement.

(j) "Variance" means a grant of relief by a community from the terms of a floodplain management zoning regulation.

(k) "Flood hazard map" means the document adopted by the governing body showing the limits of:

(1) the floodplain;

(2) the floodway;

(3) streets;

(4) stream channel; and

(5) other geographic features.

(Authorized by and implementing K.S.A. 12-766; effective, T-5-12-30-91, Jan. 1, 1992; effective Feb. 17, 1992.)

5-44-2. Floodplain management; conditions for application for approval. Before formal adoption by the governing body of any zoning regulation that establishes a floodplain zone or district, or regulates the development within a floodplain zone or district, the governing body shall apply to the chief engineer for approval of the zoning regulations. The governing body shall also apply to the chief engineer for approval of its zoning regulation when: (a) the governing body enters into, or alters its status under, the national flood insurance program;

(b) the governing body adopts a new or revised flood hazard map, base flood elevations, flood insurance study, or regulatory floodway;

(c) the governing body annexes areas containing floodplain;

(d) the governing body assumes administrative jurisdiction over the adjacent floodplain areas outside the governing body's boundaries; or

(e) the governing body changes variance procedures used in granting relief from floodplain regulations. (Authorized by and implementing K.S.A. 12-766; effective, T-5-12-30-91, Jan. 1, 1992; effective Feb. 17, 1992.)

5-44-3. Floodplain management; application for approval of zoning regulations; time limit. (a) The application for approval of zoning regulations shall consist of:

(1) a letter which:

(A) requests approval by the chief engineer under K.S.A. 12-766 on a proposed effective date, which shall not be prior to the approval by the chief engineer;

(B) proposes the date of adoption by the governing body; and

(C) states the reason for application for approval as enumerated in K.A.R. 5-44-2;

(2) a copy of the full text of the zoning regulation including maps, plans, profiles and specifications adopted by the floodplain management zoning regulations which meet the requirements of K.A.R. 5-44-4.

(b) When all the data required by the chief engineer is received, the chief engineer shall notify the governing body in writing as to the beginning and ending dates of the 90 day statutory time period for review. (Authorized by and implementing K.S.A. 12-766; effective, T-5-12-30-91, Jan. 1, 1992; effective Feb. 17, 1992.)

5-44-4. Floodplain management; zoning regulations; minimum standards and criteria. Any zoning regulation which regulates development of floodplains shall include the following minimum standards and criteria: (a) Flood hazard areas shall be identified as follows:

(1) The flood hazard area subject to floodplain management zoning regulation shall be identified by reference to a specific map used to identify the

flood hazard. The identification of the map shall include the preparer of the map and the date it was prepared.

(2) When the flood hazard map is revised and republished with a new effective date, the governing body's floodplain management zoning regulations shall amend the zoning regulations to adopt the new map by reference.

(b) The development standards shall meet or exceed the minimum requirements of the national flood insurance act of 1968, as amended, 42 U.S.C. Section 4001 *et seq.* and the regulations adopted pursuant to that act.

(c) Any development standards adopted by the governing body for which minimal requirements have been set by the chief engineer in K.A.R. 5-45-1 *et seq.* shall meet or exceed the requirements of the chief engineer.

(d) The governing body shall designate a local floodplain administrator by position or job title. The local floodplain administrator's responsibilities shall include:

(1) the review and issuance of floodplain development permits;

(2) the conduct or direction of appropriate inspections;

(3) the maintenance of any records necessary to document compliance with floodplain development permit conditions; and

(4) any other matters deemed appropriate by the governing body.

(e) The governing body shall designate by position or job title an enforcement officer who is responsible to enforce the actions of the local floodplain administrator.

(f) The local floodplain administrator and enforcement officer may be combined in a single position or job title.

(g) If any part of a proposed development is located within the floodplain, an application for floodplain development permit shall be made to the local floodplain administrator. The application for a floodplain development permit shall contain:

(1) Sufficient detail for the local floodplain administrator to determine the nature of proposed development and whether permits or approvals are needed from the governing body, state or federal authorities, especially any permits or approvals that may be required by K.S.A. 24-126 or K.S.A. 82a-301 *et seq.* and their respective regulations; and

(2) Written documentation of adequate protection from damages which could be caused by the base flood.

(h) If the proposed residential development will be located in an area designated as zone AO on a flood insurance rate map (FIRM), any new or substantially improved residential structure shall have the lowest floor (including the basement) elevated above the highest adjacent natural grade at least as high as the depth number specified in feet on the FIRM. If no depth number is specified on the FIRM, it shall be elevated at least two feet above the highest adjacent natural grade.

(i) If the proposed non-residential development will be located in an area designated as zone AO on a FIRM, any new or substantially improved non-residential structure shall be dry flood proofed or elevated to at least as high as the depth number specified in feet on the FIRM above the highest adjacent natural grade. If no depth number is specified on the FIRM, it shall be dry flood proofed or elevated at least two feet above the highest adjacent natural grade.

(j) If zone AO is not specified on the FIRM, or the proposed development will be located in the floodplain outside zone AO, then the lowest floor of any new or substantially improved residential structure shall be elevated at least one foot above the base flood elevation. The elevation of the lowest floor shall be certified by a licensed land surveyor.

(k) If zone AO is not specified on the FIRM, or the proposed development will be located in the floodplain outside zone AO, then any new or substantially improved non-residential structure shall be dry flood proofed or elevated to at least one foot above the base flood elevation. The elevation of the lowest floor shall be certified by a licensed land surveyor. If the structure is dry flood proofed, a licensed architect or a licensed professional engineer shall certify that the design and methods of construction of the dry flood proofing meet or exceed the minimum requirements of the national flood insurance act of 1968, as amended, 42 U.S.C. Section 4001 et seq. and the regulations adopted pursuant to that act. (Authorized by and implementing K.S.A. 12-766; effective, T-5-12-30-91, Jan. 1, 1992; effective Feb. 17, 1992.)

5-44-5. Floodplain management; variance procedures. Any floodplain management zoning regulations shall include procedures for the approval of a variance to the floodplain management zoning regulations. The procedures shall

stipulate the criteria for a variance and specify when a variance may be granted by the local floodplain administrator, the enforcement officer or board of zoning appeals. The procedures shall establish a board of zoning appeals for hearing appeals of decisions of the floodplain administrator or enforcement officer and establish the criteria for the appeals. Variances shall not be granted solely to avoid the requirements of a floodplain development permit. (Authorized by and implementing K.S.A. 12-766; effective, T-5-12-30-91, Jan. 1, 1992; effective Feb. 17, 1992.)

5-44-6. Floodplain management; waiver or stricter requirements. (a) The chief engineer may waive any of the regulations adopted under this article if it is shown to the satisfaction of the chief engineer that waiver of the regulation will not pose a hazard to the public safety and that such waiver is not adverse to the public interest.

(b) The chief engineer may invoke any jurisdiction granted by statute to impose stricter requirements than those required by rules and regulations where such jurisdiction or additional requirements are necessary to protect the public interest, protect the public safety or prevent damage to public or private property. (Authorized by and implementing K.S.A. 12-766; effective, T-5-12-30-91, Jan. 1, 1992; effective Feb. 17, 1992.)

Article 45.—DESIGN OF LEVEES

5-45-1. Levees and floodplain fills; definitions. As used in K.S.A. 24-126 and amendments thereto, in the regulations adopted pursuant thereto, and by the division of water resources in administrating K.S.A. 24-126, unless the context clearly requires otherwise, the following words and phrases shall have the meaning ascribed to them in this regulation: (a) "Approval" means the written approval of plans and specifications by the chief engineer authorizing the applicant to proceed with the construction and maintenance of a levee or floodplain fill project.

(b) "Authorized representative" means any staff employee designated by the chief engineer to perform duties and functions on behalf of the chief engineer.

(c) "Base flood" means a flood having a one percent chance of being equaled or exceeded in any one year.

(d) "Chief engineer" means the chief engineer, division of water resources, Kansas department of agriculture.

(e) "Design flood" means a flood having a selected probability of being equaled or exceeded in any one year for the degree of protection required.

(f) "Environmental mitigation" means any of the following:

(1) Site-specific modification of a project;

(2) implementation of a practice or management; or

(3) the reservation of a part of the project to protect or replace environmental values destroyed or adversely affected by the project.

(g) "Equal and opposite conveyance" means the location of development offsets from stream banks so that floodplain lands on each side of a stream outside the stream channel convey a share of the flood flows proportionate to the total conveyance available on each respective side of the stream.

(h) "Floodplain fill" means material, usually soil, rock, or rubble, that is placed in a floodplain to an average height of greater than one foot above the existing ground and that has the effect of diverting, restricting, or raising the level of floodwaters on a stream.

(i) "Floodway" means the channel of a stream and adjacent land areas that have been determined as being necessary to convey the base flood, as calculated using the minimum requirements of the national flood insurance act of 1968, 42 U.S.C. 4001 et seq., as amended September 23, 1994, and 44 C.F.R. part 59, subpart A, sec. 59.1 and 44 C.F.R. part 60, subpart A, sec. 60.3, as amended October 1, 1998.

(j) "Floodway fill" means floodplain fills, other than a levee, placed wholly or partially within the boundaries of the floodway at locations where the floodway has been identified.

(k) "Floodway fringe" means those portions of a floodplain outside of the boundaries of a regulatory floodway within reaches of a stream where such a floodway has been established.

(l) "Floodway fringe fill" means floodplain fills, other than a levee, placed wholly outside the floodway boundaries at locations where the floodway has been identified.

(m) "Levee" means any floodplain fill with an average height of more than one foot above the surrounding terrain constructed generally parallel to a water course and whose purpose is to repel floodwaters.

(n) "Perennial stream" means a stream, or a part of a stream, that flows continuously during

all of the calendar year, except during an extended drought.

(o) "Stream" means any watercourse that has a well-defined bed and banks, and that has a watershed above the geographic point in question that exceeds the following number of acres:

(1) Zone three: 640 acres for all geographic points within any county west of a line formed by the adjoining eastern boundaries of Phillips, Rooks, Ellis, Rush, Pawnee, Edwards, Kiowa, and Comanche counties;

(2) zone two: 320 acres for all geographic points within any county located east of zone three and west of a line formed by the adjoining eastern boundaries of Republic, Cloud, Ottawa, Saline, McPherson, Reno, Kingman, and Harper counties; and

(3) zone one: 240 acres for all geographic points within any county located east of zone two.

The stream need not flow continuously and may flow only briefly after a rain in the watershed. If the site of the project has been altered so that a determination of whether well-defined bed and banks exist is not possible, it shall be presumed that they did exist if the watershed acreage criteria have been met, unless the owner of the project can conclusively demonstrate that well-defined bed and banks did not exist before the construction of the project.

(p) "Watershed" means all of the area draining toward a selected point on a stream. (Authorized by and implementing K.S.A. 24-126; effective May 1, 1987; amended, T-5-12-30-91, Jan. 1, 1992; amended April 27, 1992; amended Sept. 22, 2000.)

5-45-2. Levees and floodplain fills; plans and specifications. Plans for a levee or a floodplain fill must be submitted on clearly legible prints (maximum size 24 inches by 36 inches) of the original tracings which are capable of reproduction. Plans for a levee or a floodplain fill shall include: (a) A general location map or aerial photograph showing:

(1) the stream;

(2) location of the proposed levee or floodplain fill;

(3) floodway limits where available;

(4) floodplain limits where available;

(5) section lines;

(6) property lines with names and addresses of adjoining landowners and any other landowners whose land may be hydraulically affected by the proposed levee or floodplain fill;

(7) drainage area;

(8) a bar scale;

(9) a north arrow;

(10) existing and proposed surface drainage flow patterns; and

(11) any other prominent features;

(b) a detailed plan view fully describing the levee or floodplain fill and the site, including:

(1) the design flood elevation and frequency;

(2) the base flood or floodplain limits where available;

(3) floodway limits where available;

(4) two-foot ground contours of the levee or floodplain fill and areas with local drainage problems; and

(5) the area reserved for environmental mitigation with a description of any necessary environmental mitigation measures to be implemented, if those measures may affect the hydraulics used to evaluate the project;

(c) a profile showing the proposed elevation of the top and base of the levee or floodplain fill, the design flood, the base flood, the stream bed and both banks;

(d) an elevation view at the most hydraulically restrictive location in the valley affected by the project, showing the levee or floodplain fill on a cross section of the stream and the valley up to the post project base flood elevation at the site. This cross section shall show:

(1) the stream;

(2) floodway limits where available;

(3) floodplain limits where available;

(4) base flood elevation; and

(5) design flood elevation;

(e) at least one permanent benchmark conveniently located for use after construction. The benchmark shall be placed where it is not likely to be destroyed. A three foot minimum length of pipe or steel driven flush with the ground in an area which is unlikely to be disturbed may be used. Wood or plastic stakes, nails or marks in trees shall not be considered as permanent benchmarks. The location and description of the benchmark shall be shown on the plans. They shall be properly referenced so they can be easily found in the field. The location, description and elevation of the permanent benchmark shall be shown on the plans. The benchmark may be a benchmark identified in the community's flood insurance rate map if the benchmark is less than 500

feet from the fill. Reference to the national geodetic vertical datum of 1988, or other acceptable national vertical datum, to a tolerance of plus or minus one half foot is required for all levees and floodplain fills on perennial streams. Reference to a tolerance of 0.05 foot is required where detailed floodplain data are available. Project datum is acceptable on all other levee and floodplain fill projects; and

(f) the land for which easements or rights-of-way have been acquired when the proposed levee or floodplain fill will affect land other than that owned by the applicant. (Authorized by and implementing K.S.A. 1991 Supp. 24-126; effective May 1, 1987; amended, T-5-12-30-91, Jan. 1, 1992; amended April 27, 1992.)

5-45-3. Levees and floodplain fills; specifications. The specifications for levees and floodplain fills shall be prepared on 8½ by 11 inch sheets of a good grade of white bond paper. The specifications shall be in sufficient detail to assure that the works will be properly executed and shall comply with currently accepted engineering practices. The specifications shall include provisions for: (a) adequate supervision during the period of construction by a person qualified to design the levee or floodplain fill;

(b) notification of the division of water resources of the status of construction; and

(c) inspection by a representative of the division of water resources. (Authorized by and implementing K.S.A. 24-126 as amended by L. 1991, ch. 56, sec. 27; effective May 1, 1987; amended, T-5-12-30-91, Jan. 1, 1992; amended April 27, 1992.)

5-45-4. Levees and floodplain fills; preparer of maps, plans, profiles, and specifications. In addition to the requirements of the Kansas board of technical professions, the following requirements shall apply: (a) Each map, plan, profile, and specification submitted to the chief engineer for approval pursuant to K.S.A. 24-126 and amendments thereto shall be prepared by a person who is competent in levee or floodplain fill design and construction.

(b) Map, plans, profiles, and specifications for any of the following described levees and floodplain fills shall be prepared by a licensed professional engineer that is competent in levee or floodplain fill design and construction:

(1) Class C levees;

(2) floodplain fills located in whole or in part in identified floodways; and

(3) floodplain fills that meet the following criteria:

(A) Are located in areas without a designated floodway;

(B) are greater than 3,200 cubic yards in volume;

(C) are more than four feet in height; and

(D) are more than 100 feet from other floodplain fills.

(c) No provision of this regulation, nor any decision made by the chief engineer pursuant to this regulation, shall alter the responsibilities or duties of any licensee of the Kansas board of technical professions to comply with that board's requirements. (Authorized by and implementing K.S.A. 24-126; effective May 1, 1987; amended, T-5-12-30-91, Jan. 1, 1992; amended April 27, 1992; amended Sept. 22, 2000.)

5-45-5. Levees; waiver and stricter requirements. The chief engineer may waive any of the regulations adopted under this article if it is shown to the satisfaction of the chief engineer that the waiver of the regulation will not pose a hazard to the public safety and that the waiver is in the public interest. The chief engineer may also invoke any jurisdiction granted by statute to impose stricter requirements than those required by rules and regulations where such jurisdiction or additional requirements are necessary to protect the public interest, protect the public safety or prevent damage to property. (Authorized by and implementing K.S.A. 24-126; effective May 1, 1987.)

5-45-6. Levees and floodplain fills; other maps, plans, profiles, data and specifications. The applicant shall also submit any other maps, plans, profiles and specifications of the levee or floodplain fill project and any other data which the chief engineer may require. (Authorized by and implementing K.S.A. 24-126 as amended by L. 1991, ch. 56, sec. 27; effective May 1, 1987; amended, T-5-12-30-91, Jan. 1, 1992; amended April 27, 1992.)

5-45-7. Levees and floodplain fills; application. (a) The application for approval of plans to construct a levee or floodplain fill shall be filed on the form(s) prescribed by the chief engineer, including application supplements, and shall be completed in proper form according to

the instructions. To be complete, the application shall include:

(1) application DWR No. 3-100.1;

(2) the application supplement, DWR Form No. 2-102;

(3) plans fully complying with requirements of K.A.R. 5-45-2;

(4) specifications fully complying with requirements of K.A.R. 5-45-3; and

(5) a copy of an application to the governing body for a floodplain development permit, if the proposed levee or floodplain fill will change the limits of the floodplain or floodway boundaries, or both.

(b) The statutory time limit on the chief engineer's deliberation for approval for floodway fringe fills shall not begin until the application is complete. When such a floodway fringe fill application is received by the chief engineer, it will be reviewed to determine whether or not it is complete. If the application is complete, the chief engineer will notify the applicant when the 90-day review period began and will end. If the application is not complete, the additional information will be requested and the applicant informed that the 90-day statutory review period has not yet begun. For a floodway fringe fill application, when comments are received as a result of the water projects environmental coordination act review under K.S.A. 82a-325, et seq., which require modification of the plans, the 90-day statutory time limit shall be suspended from the time the modifications are requested by the chief engineer until satisfactory modifications of the plans are received by the division of water resources. When the appropriate modifications have been received, the 90-day time limit will begin again with the same number of days remaining as were remaining at the time of the suspension. The applicant shall be notified in writing as to the dates of the suspension and restart of the 90-day time limit. (Authorized by and implementing K.S.A. 1991 Supp. 24-126; effective May 1, 1987; amended, T-5-12-30-91, Jan. 1, 1992; amended April 27, 1992.)

5-45-8. Levees; hazard classes. The following levee hazard classes are established: (a) Class A levee—failure of levee may allow damage to farm buildings, limited agricultural grounds or private roads.

(b) Class B levee—failure of levee may endanger extensive agricultural land, or damage isolated homes, secondary highways or minor railroads.

(c) Class C levee—failure of levee may cause loss of life, or cause serious damage to private, commercial or public property. (Authorized by and implementing K.S.A. 24-126; effective May 1, 1987.)

5-45-9. Levees; design storm flow determination. (a) In determining design storm flow magnitude, the applicant shall use an accepted engineering method.

(b) For drainage areas of less than 2 square miles the following methods are acceptable, where appropriate: (1) The rational formula for flow magnitude determination when used according to the following formula:

$$Q = CIA$$

Where C = the runoff coefficient
I = intensity of rainfall in inches per hour and
A = drainage area in acres.

To determine the proper intensity of rainfall for use with the formula, first determine the appropriate total rainfall from "Technical Paper Number 40, Rainfall Frequency Atlas of the United States, *Department of Commerce,* May 1961," and the time of concentration from the Kirpich nomograph and then obtain the intensity from the standard rainfall intensity-duration curves;

(2) The SCS method for estimating direct runoff, United States department of agriculture, soil conservation service;

(3) "Technical Release 55, Hydrology for Urban Areas, *United States Department of Agriculture, Soil Conservation Service.*"

(c) For drainage areas two square miles or greater, the following methods of determining flow magnitude shall be acceptable, where appropriate: (1) the publication "Magnitude and Frequency of Floods in Kansas, Unregulated Streams, Technical Report 11, *Kansas Water Resources Board,* February 1975";

(2) "Technical Release 20, Computer Program for Project Formulation, Hydrology, *United States Department of Agriculture, Soil Conservation Service";* or

(3) "HEC-1 Flood Hydrograph Package, *Corps of Engineers Hydrologic Engineering Center.*" (Authorized by and implementing K.S.A. 24-126; effective May 1, 1987.)

5-45-10. Levees; design criteria. Design for levees shall meet or exceed the following criteria: (a) Class A levee—the levee shall safely repel the appropriate design storm.

(b) Class B levee—the levee shall safely repel at least the ten year design storm.

(c) Class C levee—the levee shall safely repel at least the 100 year design storm. For class C levees the applicant shall submit complete water surface water profiles of both the ten and 100 year events, both before and after construction. (Authorized by and implementing K.S.A. 24-126; effective May 1, 1987.)

5-45-11. Levees; freeboard requirements. (a) Levees not within a floodway designated by the chief engineer are required to have the following freeboard:

Design flood frequency	*Freeboard required*
10 years	1 foot
25 years	2 feet
50 years or more	3 feet

(b) Levees constructed within a floodway designated by the chief engineer shall have a freeboard requirement designated on a site specific basis. (Authorized by and implementing K.S.A. 24-126; effective May 1, 1987.)

5-45-12. Levees and floodplain fills; setback. Except for highway and road crossings of streams, the minimum setback distance from the top of the stream bank to the nearest toe of the levee or the edge of the floodplain fill shall be 100 feet, or twice the width of the stream measured from the top of one bank to the top of the opposite bank, whichever distance is less, unless the applicant demonstrates that adequate bank protection will be utilized. (Authorized by and implementing K.S.A. 1991 Supp. 24-126; effective May 1, 1987; amended, T-5-12-30-91, Jan. 1, 1992; amended April 27, 1992.)

5-45-13. Levees; floodplain fills; unreasonable effect. (a) Except as set forth in subsection (b), no plans for any levee or floodplain fill that has an unreasonable effect on another shall be approved by the chief engineer. An unreasonable effect caused by a levee or floodplain fill shall be deemed any of the following:

(1) An increase in the elevation of the design and base flood profiles of more than one foot at any location outside a floodway;

(2) any increase in the elevation of the design and base flood profiles within a floodway; or

(3) a cumulative increase of more than one foot in the elevation of the design and base flood profiles.

(b) A levee or floodplain fill that has an unreasonable effect on another may be approved by the chief engineer subject to any conditions necessary to protect the public interest if either of the following criteria is met:

(1) The applicant demonstrates to the chief engineer that the applicant has obtained legal authorization from any landowner whose land is unreasonably hydraulically affected by a greater increase in the elevation of the design and base flood profile.

(2) The following conditions are met:

(A) The owner of the undeveloped, unplatted land that will be hydraulically affected by an increase in the design and base flood profiles of more than one foot by a federal or state cost-shared roadfill, bridge, or culvert replacement project has been notified of the proposed hydraulic effects by the chief engineer.

(B) The owner has failed to object within the time limit set forth in the notice.

(C) The chief engineer determines that the increase will not be likely to materially damage the private or public property. (Authorized by and implementing K.S.A. 24-126; effective May 1, 1987; amended, T-5-12-30-91, Jan. 1, 1992; amended April 27, 1992; amended Sept. 22, 2000.)

5-45-14. Levees and floodplain fills; hydrologic and hydraulic analysis. (a) The applicant shall submit a hydrologic and hydraulic analysis for every levee and floodplain fill project except floodway fringe fill projects and those levee projects and floodplain fill projects not identified in K.A.R. 5-45-4(b). The hydrologic and hydraulic analysis shall include the design and base floods for main streams, tributary streams, and local drainage, describing the existing and proposed conditions with the application and plans.

(b) The effect of a proposed levee or floodplain fill shall be calculated by the technique of equal conveyance reduction, except as provided in subsections (c) and (d), unless it meets either of the following criteria:

(1) The applicant demonstrates that the applicant has obtained legal authorization from any landowner whose land is unreasonably hydraulically affected by a greater encroachment toward the channel.

(2) The following conditions are met:

(A) The owner of the undeveloped, unplatted land that will be hydraulically affected by an increase in the elevation of the base flood profile of more than one foot by a federal or state cost-

shared roadfill, bridge, or culvert project has been notified of the proposed hydraulic effects by the chief engineer.

(B) The owner has failed to object within the time limit set forth in the notice.

(C) The chief engineer determines that the increase will not be likely to materially damage the private or public property.

(c) For a class A or class B levee, the effect of the proposed levee on the design flood profile shall be evaluated with the assumption that an equal setback levee is in place on the opposite side of the stream.

(d) For a class C levee, the effect of the proposed levee on the design flood profile shall be calculated by the technique of equal conveyance reduction from the outer floodplain limits outside the channel, unless the applicant demonstrates that the applicant has obtained legal authorization from all landowners whose land would be unreasonably hydraulically affected by a greater encroachment toward the channel. (Authorized by and implementing K.S.A. 24-126; effective, T-5-12-30-91, Jan. 1, 1992; effective April 27, 1992; amended Sept. 22, 2000.)

5-45-15. Floodplain fills; design criteria. Floodplain fills shall meet or exceed the following design criteria: (a) the sideslopes shall not be steeper than one vertical to three horizontal, unless the applicant submits data and analysis to show that a steeper slope will be stable.

(b) Floodplain fills shall be adequately protected from erosion and undermining from floods up to the level of the base flood elevation and surface drainage by the use of vegetative cover, riprap or other means.

(c) Floodplain fills shall not unreasonably obstruct or divert the flow of surface water and other waters from the main stream and tributaries to the main stream to the detriment of adjacent or hydraulically affected property owners.

(d) Floodplain fills shall not obstruct utility or other easements without proper authorization.

(e) Floodplain fills shall not unreasonably affect the environment without adequate environmental mitigation.

(f) Floodplain fills, other than levees, for residential buildings, including manufactured housing, are required to be of adequate height to raise the lowest floor, including the basement, at least one foot above the base flood elevation, unless:

(1) an exception has been granted by the flood insurance administrator of the flood insurance administration within the FEMA for the allowance of a basement; or

(2) the chief engineer has approved a community standard at or above base flood elevation.

(g) Floodplain fills other than levees for sewage lagoons and sanitary landfills are required to have at least one foot of freeboard above the base flood.

(h) Except for fills for highways and roads, all other floodplain fills other than levees are required to have at least one foot of freeboard above the design flood.

(i) If subsequent to approval of the floodplain fill by the chief engineer, a letter of map revision or letter of amendment is obtained from FEMA removing an area of the approved or permitted fill from the floodplain, then any permit or approval issued by the chief engineer no longer applies to that area removed from the floodplain. (Authorized by and implementing K.S.A. 1991 Supp. 24-126; effective, T-5-12-30-91, Jan. 1, 1992; effective April 27, 1992.)

5-45-16. Floodplain fills; disapproval. (a) A levee or floodplain fill should not have an unreasonable effect on adjacent landowners, be adverse to the public interest and environmental concerns or lack required environmental mitigation.

(b) Within six months of the disapproval, the applicant may make a written request to the chief engineer to rescind the disapproval by providing information or modifications of the plans requested by the chief engineer. (Authorized by and implementing K.S.A. 24-126 as amended by L. 1991, ch. 56, sec. 27; effective, T-5-12-30-91, Jan. 1, 1992; effective April 27, 1992.)

5-45-17. Exemption—floodway fringe fills. Floodway fringe fills are exempt from applying for and obtaining approval from the chief engineer if: (a) they are:

(1) up to 1600 cubic yards in size;

(2) with a maximum height of two feet;

(3) more than 100 feet away from any other floodplain fills; and

(4) constructed according to the design criteria in K.A.R. 5-45-15; or

(b) they are located in communities which have adopted local standards for floodway fringe fills approved by the chief engineer which meet or exceed the standards adopted by the chief engineer for individual floodway fringe fills. The standards shall include an appeal process, an environmental

assessment and a review of local drainage. (Authorized by and implementing K.S.A. 1991 Supp. 24-126; effective, T-5-12-30-91, Jan. 1, 1992; effective April 27, 1992.)

5-45-18. Floodplain fills; incidental to bridge and culvert replacement projects. Each floodplain fill constructed incidental to a bridge or culvert replacement project that otherwise meets the requirements of K.A.R. 5-46-1 shall be considered to have the necessary approval of plans pursuant to K.S.A. 24-126, and amendments thereto, and article 45 of the rules and regulations adopted by the Kansas department of agriculture, division of water resources. (Authorized by and implementing K.S.A. 24-126; effective Sept. 22, 2000.)

Article 46.—GENERAL PERMITS

5-46-1. General permits; bridge and culvert replacement projects. (a) Except as provided in subsection (e), the construction of any bridge or culvert replacement project with a watershed of 2,560 or more acres in zone one, 3,840 or more acres in zone two, and 5,120 or more acres in zone three shall meet the criteria in subsection (c) of this regulation. Before construction, the applicant shall apply for and obtain a general permit from the chief engineer. The application shall be filed on a form prescribed by the chief engineer and shall be accompanied by plans or sketches meeting the requirements of K.A.R. 5-42-2.

(b) Except as provided in subsection (e), the construction of any bridge or culvert replacement project with a watershed of fewer than 2,560 acres in zone one, 3,840 acres in zone two, and 5,120 acres in zone three shall meet the criteria in subsection (c) of this regulation. Before construction, the applicant shall properly complete an application for, and receive the consent of, the chief engineer. The application shall be filed on a form prescribed by the chief engineer.

(c) Each bridge replacement and culvert replacement project shall meet all of the following criteria:

(1) The project shall not be a change either in alignment or in the cross section of a stream of more than 200 feet in length on minor streams, and not more than 400 feet in length on moderate or major streams as measured along the original channel. A minor stream is defined as a stream or watercourse that has a mean annual flow of less than five cubic feet per second (cfs). The major streams are the Kansas River, the Arkansas River, and the Missouri River. A moderate stream is defined as a stream or watercourse with a mean annual flow equal to or greater than five cfs, but is not a major stream.

(2) The proposed culvert or bridge replacement shall have the following:

(A) A cross-sectional area at least equivalent to that of the original bridge or culvert for water to flow over, through or around; and

(B) a road grade across the floodplain and approaching the bridge or culvert that is not raised by more than an average of one foot. The average rise of the road grade shall be calculated by measuring the difference between the proposed grade and the existing grade at the beginning and end of each interval of 100 or fewer feet, dividing the sum of the two differences by two and multiplying the mean by the number of feet in the interval. The sum of these calculations from each interval shall then be added together and the total sum divided by the length, in feet, of the road alteration. The average road grade shall not increase by a cumulative amount of more than one foot since April 11, 1978.

(3) A vegetative strip measuring 50 feet from the bank and outward on each side of a channel change shall be maintained in a manner consistent with the existing riparian vegetation and other design criteria.

(4) The project shall not alter the channel's cross-sectional area by more than 15 percent, nor shall it alter the channel length by more than 10 percent.

(d) If any bridge or culvert replacement project does not meet the requirements of this regulation, the applicant may apply for a nongeneral permit pursuant to K.S.A. 82a-301 et seq., and amendment thereto, before construction.

(e) If any bridge or culvert replacement project does not meet the requirements of this regulation or the chief engineer determines that the project may have an unreasonable effect on the public interest, public safety, or environmental interests, the right to perform the following shall be reserved by the chief engineer:

(1) Require a general permit meeting the requirements of this regulation or a nongeneral permit meeting the requirements of K.S.A. 82a-301 et seq., and amendment thereto, before construction; and

(2) amend, modify, or revoke the prior general

permit or consent issued in accordance with this regulation. (Authorized by K.S.A. 82a-303a; implementing K.S.A. 82a-303; effective Sept. 22, 2000.)

5-46-3. General permits; sand and gravel removal operations. (a) Before the commencement or continuation of any sand or gravel removal from a site with a drainage area of 50 or more square miles above the site, the removal operation shall meet the criteria in subsection (c) of this regulation. Before the removal of any sand and gravel, the owner shall apply for and obtain a general permit from the chief engineer. The application shall be filed on a form prescribed by the chief engineer and shall be accompanied by plans meeting the requirements of K.A.R. 5-42-2.

(b) If the proposed sand or gravel removal operation meets the criteria set forth in subsection (c) of this regulation and there are fewer than 50 square miles of drainage area above the proposed sand or gravel removal site, a permit shall not be required unless the chief engineer determines that a permit is necessary to protect the public interest, public safety, or environmental interests.

(c) All sand and gravel operations covered by this regulation shall meet the following criteria:

(1) The sand and gravel removal operation shall be limited to removing a maximum of 100 cubic yards per year from each sand and gravel removal site. Other than bridge maintenance sites, all sand and gravel removal operations on the same stream and its tributaries shall be separated by at least 1,320 feet.

(2) A sand and gravel removal operation shall not be located within the following distances of a bridge, pipeline, cable crossing, levee, or other feature, except when the written permission or easement of the owner of the bridge, pipeline, cable crossing, levee, or other feature is obtained by the applicant, and a written waiver is granted by the chief engineer:

(A) 50 feet of the banks, or in the channels of the Missouri, Kansas, or Arkansas rivers, and 50 feet of the banks, or in the channels of their tributaries, for ½ mile upstream from the mouth of the tributaries;

(B) one mile of a public water supply intake;

(C) 500 feet of a bridge;

(D) 300 feet of a buried pipeline or cable crossing; and

(E) 200 feet of a levee or other feature subject to damage.

(3) Stockpiles of material shall be located in a manner that does not affect the flow of water on the property of any other landowner.

(d) If any sand or gravel removal operation covered by this regulation does not meet the requirements of this regulation, or if the chief engineer determines that the operation may have an unreasonable effect on the public interest, public safety, or environmental interests, the right to perform the following shall be reserved by the chief engineer:

(1) Require a nongeneral permit pursuant to K.S.A. 82a-301 et seq., and amendments thereto; and

(2) amend, modify, or revoke the general permit issued in accordance with this regulation. (Authorized by K.S.A. 82a-303a; implementing K.S.A. 82a-303; effective Sept. 22, 2000.)

5-46-4. General permits; pipeline crossings. (a) Before the construction of any pipeline or buried cable crossing of a stream having 50 or more square miles of drainage area above the proposed project site, the project shall meet the requirements of subsection (c) of this regulation. Before construction, the owner shall apply for and obtain a general permit from the chief engineer. The application shall be filed on a form prescribed by the chief engineer.

(b) Any pipeline or buried cable crossings of streams that have fewer than 50 square miles of drainage area above the proposed project site and that meet the requirements of subsection (c) of this regulation shall not be required to have a permit pursuant to K.S.A. 82a-301 et seq., and amendments thereto.

(c) All pipeline or buried cable crossings covered by this regulation shall meet the following requirements:

(1) Underground pipelines and cables shall be buried at a depth below the stream bed sufficient to prevent exposure. For navigable streams, underground pipelines and cables shall be buried at a minimum depth of seven feet beneath the stream bed. For all other streams, underground pipelines and cables shall be buried at a minimum depth of five feet beneath the stream bed. Pipelines and cables shall be buried sufficiently into the banks to allow for a moderate amount of stream meander without exposure. The minimum depth may be waived if the owner or applicant demonstrates that the underground pipeline or cable is adequately protected against erosion.

(2) After installation, the channel and banks shall be restored to the natural elevations and configurations as nearly as possible. Armoring devices shall be installed when necessary to ensure bank stability. Surplus excavated material shall be disposed of in a manner that will not obstruct the channel or act as a levee.

(d) If any pipeline or buried cable crossing covered by this regulation does not meet the requirements of this regulation, or if the chief engineer determines that a pipeline or cable crossing may have an unreasonable effect on the public interest, public safety, or environmental interests, the right to perform the following shall be reserved by the chief engineer:

(1) Require a nongeneral permit pursuant to K.S.A. 82a-301 et seq., and amendments thereto; and

(2) amend, modify, or revoke the general permit issued in accordance with this regulation. (Authorized by K.S.A. 82a-303a; implementing K.S.A. 82a-303; effective Sept. 22, 2000.)

Articles 47 to 49. RESERVED

Article 50.—WATER TRANSFERS

5-50-1. Definitions. As used in these rules and regulations, unless the context clearly requires otherwise: (a) "Application" means the document, made on the prescribed form furnished by the chief engineer, to request a permit to transfer water. The application shall be filed in the office of the chief engineer as provided in K.S.A. 82a-1501 et seq., as amended.

(b) "Approval of application" means issuance of a permit to transfer water as defined in K.S.A. 82a-1501(a)(1), as amended. (Authorized by K.S.A. 82a-1506; implementing K.S.A. 1995 Supp. 82a-1501; effective May 1, 1984; amended Dec. 27, 1996.)

5-50-2. Requirements for application. To be complete, a water transfer application shall show the following: (a) the name and mailing address of the applicant;

(b) the maximum quantity of water proposed to be transferred in a calendar year and the proposed maximum diversion rate;

(c) the location of the proposed point or points of diversion;

(d) the location of the proposed point or points of use;

(e) the proposed use made of the water;

(f) any economically and technologically feasible alternative source or sources of supply available to the applicant and to any other present or future users of the water proposed to be transferred. The water transfer application shall specify why this source of supply was selected over the alternative sources available;

(g) the proposed plan of design, construction and operation of any works or facilities used in conjunction with carrying the water from the point or points of diversion to the proposed point or points of use. The proposed plan shall be in sufficient detail to enable all parties to understand the impacts of the proposed water transfer;

(h) the estimated date for completion of the infrastructure and initial operation thereof;

(i) that the benefits to the state if the transfer is approved outweigh the benefits to the state if the transfer is not approved;

(j) that the proposed transfer will not impair water reservation rights, vested rights, appropriation rights or prior applications for permits to appropriate water;

(k) any current beneficial use of the water that is proposed to be transferred, including minimum desirable streamflow requirements;

(l) any reasonably foreseeable future beneficial use of the water;

(m) the economic, environmental, public health and welfare, and other impacts of approving or denying the transfer of water;

(n) any and all measures the applicant has taken to preserve the quality and remediate any contamination of water currently available for use by the applicant;

(o) the provisions of a revised management program adopted by a groundwater management district that are applicable to the proposed transfer whenever any of the proposed points of diversion are located within a groundwater management district;

(p) whether or not the applicant, and any entity to be supplied water by the applicant, have adopted and implemented conservation plans and practices that fulfill the following requirements:

(1) are consistent with guidelines developed and maintained by the Kansas water office, pursuant to K.S.A. 74-2608 and its amendments;

(2) have been in effect for not less than 12 consecutive months immediately before the filing of this water transfer application; and

(3) provide for a rate structure that encourages efficient use of water and results in conservation

and wise, responsible use of water, if the transfer is for use by a public water supply system;

(q) the effectiveness of conservation plans and practices that have been adopted and implemented by the applicant and any other entities to be supplied water by the applicant;

(r) if applicable, population projections for any public water supply system that will be supplied by the water transfer, and the basis for those projections;

(s) the projected water needs of the applicant and of any other entities to be supplied water by the applicant, and the basis for those projections;

(t) plans for any environmental mitigation made necessary by the proposed water transfer;

(u) a list of other federal, state and local permits necessary to complete the proposed water transfer and the projected dates they will be obtained;

(v) the current per capita per day usage of any public water supply user to be supplied water by the applicant, and the current average per capita per day usage of other similar users in a region of the state that is climatically similar. If the applicant's per capita per day usage exceeds the regional average, the applicant shall show why its per capita per day usage is reasonable.

(w) the projected per capita per day usage of any public water supply user to be supplied water by the applicant;

(x) a copy of the following contingently approved documents;

(1) a permit to appropriate water;

(2) an application for change in any or all of the following:

(A) the place of use;

(B) the type of use;

(C) point of diversion; or

(3) a contract to purchase water pursuant to the state water plan storage act;

(y) pursuant to K.A.R. 28-16-28b and K.A.R. 28-16-28d, the impacts of the proposed transfer on the water quality and designated uses of any stream that may be affected by the proposed transfer; and

(z) any additional factors that may be required by the chief engineer. (Authorized by K.S.A. 82a-1506; implementing K.S.A. 1995 Supp. 82a-1503; effective May 1, 1984; amended Dec. 27, 1996.)

5-50-3. (Authorized by K.S.A. 82a-1506; implementing K.S.A. 1995 Supp. 82a-1503; effective May 1, 1984; revoked Dec. 27, 1996.)

5-50-4. Emergency use. When a temporary emergency transfer of water has been approved, the chief engineer shall: (a) Require the applicant to compile and submit records, as necessary, regarding the daily rate and quantity of water transferred and any other information pertinent to the continued need for emergency transfer; and

(b) require the person requesting the transfer to consider alternate sources of water so the continued transfer will not be necessary. (Authorized by K.S.A. 82a-1506; implementing K.S.A. 1995 Supp. 82a-1502; effective May 1, 1984; amended Dec. 27, 1996.)

5-50-5. Emergency transfer of water. If the emergency causing the necessity for the transfer of water continues beyond one year, the person requesting the transfer may only file another new application for transfer for emergency use. This new application shall state the need for the water and the reasons why the need for transfer of water still exists and cannot be supplied by an alternate source. (Authorized by K.S.A. 82a-1506; implementing K.S.A. 1995 Supp. 82a-1502; effective May 1, 1984; amended Dec. 27, 1996.)

5-50-6. Authority of the chief engineer. All emergency transfers of water shall be reviewed by the chief engineer to determine whether the applicant complied with the terms, conditions, and limitations of the emergency transfer approval. (Authorized by K.S.A. 82a-1506; implementing K.S.A. 1995 Supp. 82a-1503; effective May 1, 1984; amended Dec. 27, 1996.)

5-50-7. Filing an application. Unless this requirement is waived by the chief engineer for good cause, a water transfer application shall not be considered complete until one of the following has been approved contingent upon receiving a permit to transfer water: (a) a new application to appropriate water pursuant to the Kansas water appropriation act (KWAA), K.S.A. 82a-701 *et seq.*;

(b) an application for a change in any or all of the following:

(1) point of diversion;

(2) place of use; or

(3) use made of water filed pursuant to the KWAA; or

(c) a contract for the purchase of water pursuant to the state water plan storage act, K.S.A. 82a-1301, *et seq.* (Authorized by K.S.A. 82a-1506;

implementing K.S.A. 1995 Supp. 82a-1503; effective Dec. 27, 1996.)

5-50-8. Selection of hearing officer. (a) The panel shall mail notices to, and request nominations for a hearing officer from:

(1) the applicant;

(2) entities in the area or basin where the potential point or points of diversion are located; and

(3) the commenting agencies.

(b) The panel shall also publish one notice in the Kansas register requesting nominations for a hearing officer. The panel shall allow 30 days following the notice for the nominations to be submitted.

(c) After the 30-day notice period has expired, the panel shall meet to consider the nominations and select an independent hearing officer. (Authorized by K.S.A. 82a-1506; implementing K.S.A. 1995 Supp. 82a-1501a; effective Dec. 27, 1996.)