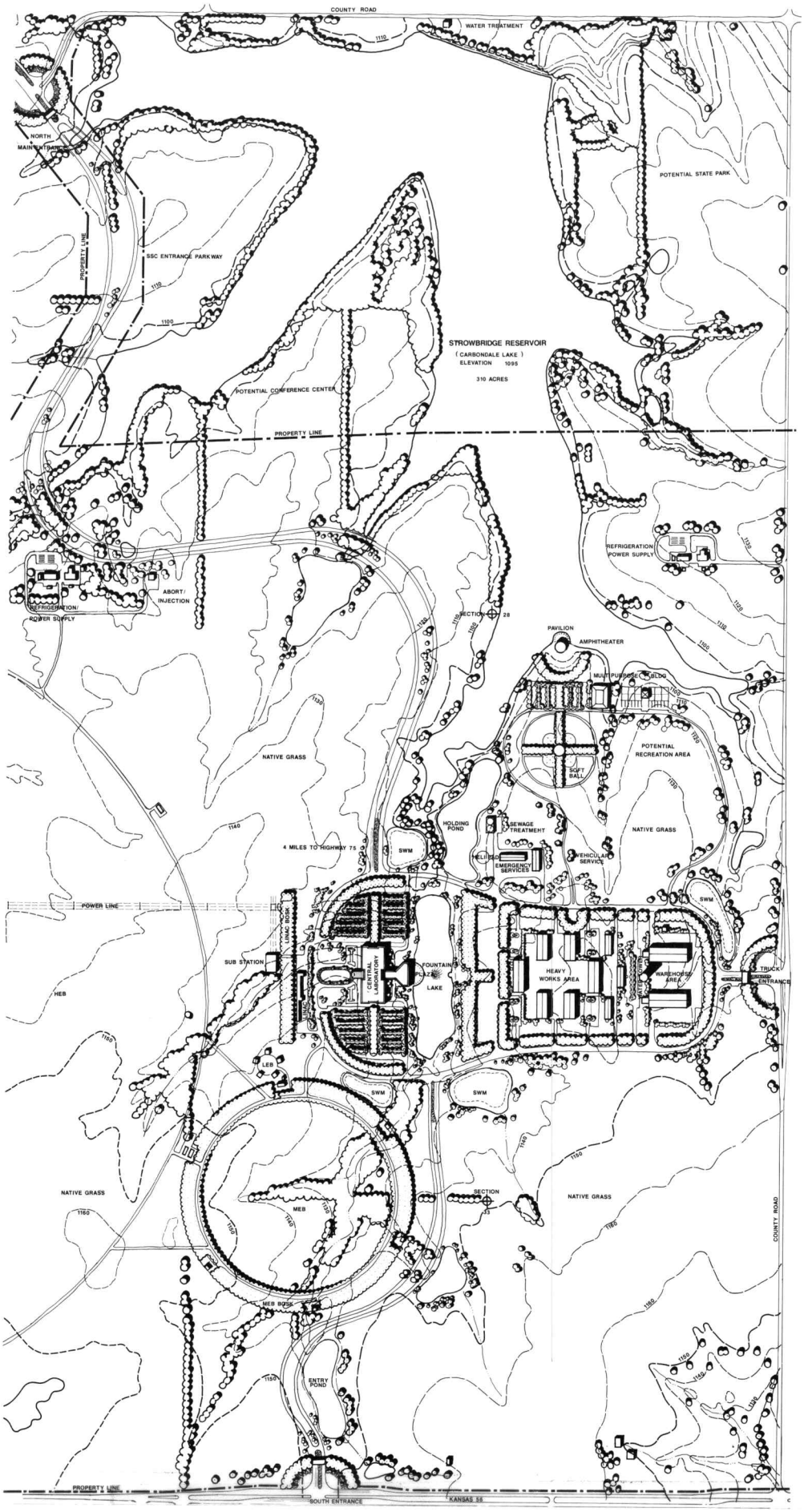
Acknowledgments

Kansas SSC Project Managers gratefully acknowledge the contributions of the individuals and institutions whose hard work made this proposal possible.

Our thanks to the Kansas Geological Survey and the Kansas Biological Survey at Lawrence and the Kansas State University College of Architecture and Design at Manhattan for a superb demonstration of applied research; the officers and employees of the Kansas Power and Light and the Kansas City Power and Light companies whose commitment set a new standard of corporate citizenship; and to the scores of officials of the Kansas Departments of Transportation, Health and Environment, Commerce, Revenue, Wildlife and Parks, Education, the Kansas Corporation Commission, and the Kansas Water Office whose work honored the best traditions of public service.

Special thanks is due to Frank W. Wilson of the Kansas Geological Survey whose relentless commitment to the enterprise sparked it, carried it through to completion, and served as a continuing inspiration to the team.

Missing Pages #5-6 of Volume #2



Campus-area Site Plan

Super Conducting Supercollider Site Proposal *Kansas*

SCALE 1-200-0

1/8 MILE 1/4 MILE 1/2 MILE

0 200 400 800 1000

Table of Contents

SITE OVERVIEW	1	Regional Resources	6
THE OFFER	1	Environment	7
SUPPORTING INFORMATION	4	Setting	8
QUALIFICATION CRITERIA	4	Regional Conditions	8
TECHNICAL EVALUATION CRITERIA	5	Utilities	8
Geology and Tunneling	5		

Figures

1.1—500-mile radius of the site	2	1.3—Idealized conceptual site	4
1.2—Four-county area of the site	3	1.4—Kansas proposed site	5

Volume 1—Executive Summary

SITE OVERVIEW

The Superconducting Super Collider site proposed by the State of Kansas is located in Osage County, a predominantly rural county of 16,000 people situated in east-central Kansas (Figures 1.1 and 1.2). The SSC main campus, injector, and future expansion areas are located at the intersection of U.S. Highways 75 and 56, 16 miles south of the state's capital city of Topeka and 70 miles west of downtown Kansas City, Missouri.

The site is characterized by gently rolling topography, lush natural and cultivated vegetation, and great natural beauty. Numerous recreational and water-supply lakes within and adjacent to the ring area add to the region's attractiveness and suitability.

In consideration of the region's geological characteristics and the desire to minimize adverse environmental impacts at the surface, the Kansas proposal assumes tunnel construction for the SSC ring and interaction halls. The collider tunnel would be set at an elevation of 865 feet above sea level, with a resultant surface-to-tunnel depth of 275 feet at interaction point K-1. Tunneling can be readily accomplished in the formations beneath the site by rapid machine-excavation techniques. Excavation spoils can be safely and inexpensively disposed of at nearby sites.

The region and the site are rich in natural and human-made assets including plentiful electric power, natural gas, and water supplies; affordable housing; state-of-the-art medical facilities; and recreational and cultural opportunities. The site is served by a well-developed network of interstate and state highways, local roads, multiple rail lines, and readily accessible air service (Figures 1.3 and 1.4).

Because the area is largely rural, yet located within easy access of Topeka, Lawrence, and the Kansas City metropolitan area, a wide range of lifestyles is available for the SSC work force. Urban, suburban, and rural living are readily available within easy commuting distance of the proposed site.

The University of Kansas at Lawrence is 36 miles to the northeast, and Kansas State University at Manhattan is a 1-hour drive northwest of the site by interstate highway. Both universities enjoy superb national reputations and offer a full range of academic opportunities to the SSC staff and their families.

The area's industrial and construction resources and its labor pool are more than adequate to meet project needs. The successful completion of the Wolf Creek Generating Station, a nuclear power plant at Burlington, Kansas, in 1985, demonstrated the region's capacity for high-technology, heavy-works construction.

Kansas enjoys a long history of commitment to equal opportunity, affirmative action, and progressive social attitudes that dates from its entry into the union as a free state. Political values are stable and consistent, labor-management relations are sound, and labor strife is virtually unknown.

Detailed analysis reveals no significant environmental obstacles to be overcome in siting the SSC in Kansas, and the carrying capacity of the region's natural-resource base can readily support the facility's requirements. The region's air, water, and other natural-resource assets are among the best in the United States and contribute to a superb overall quality of life.

Local communities in the immediate area of the proposed site are well informed about the SSC and its potential impact. Broad-based support has been gained through an extensive process of community meetings. The population is well educated, hard working, and characterized by traditional mid-American values of neighborliness, independence of spirit, and pride. The SSC can rely upon a local populace eager to welcome the facility and its work force into their communities.

THE OFFER

The State of Kansas offers 7,863 surface acres in fee simple title and 8,435 subsurface acres in stratified fee title to meet the facility requirements listed in Table B-1 (Land Requirements for the SSC) of the Invitation for Site Proposals (ISP).

In addition, 374 acres of surface-utility easements will be acquired by Kansas and conveyed to the DOE if the Department utilizes above-ground utility distribution (Option B, SSC Conceptual Design Report, Conventional Facilities).

All land offered will be acquired and conveyed to the DOE in accordance with the priorities and schedules presented in Section 6.2. The required acquisition authority and appropriations have been enacted by the Kansas Legislature and signed into law by the Governor.

In addition to the land required by the ISP, the Kansas proposal includes commitments to selectively enrich existing assets of the proposed site, thereby assuring the DOE of reliable, easy solutions to facility requirements.

1. An additional 1,020 surface acres will be acquired by the State of Kansas for spoils-disposal sites and a preliminary tunneling staging area. The

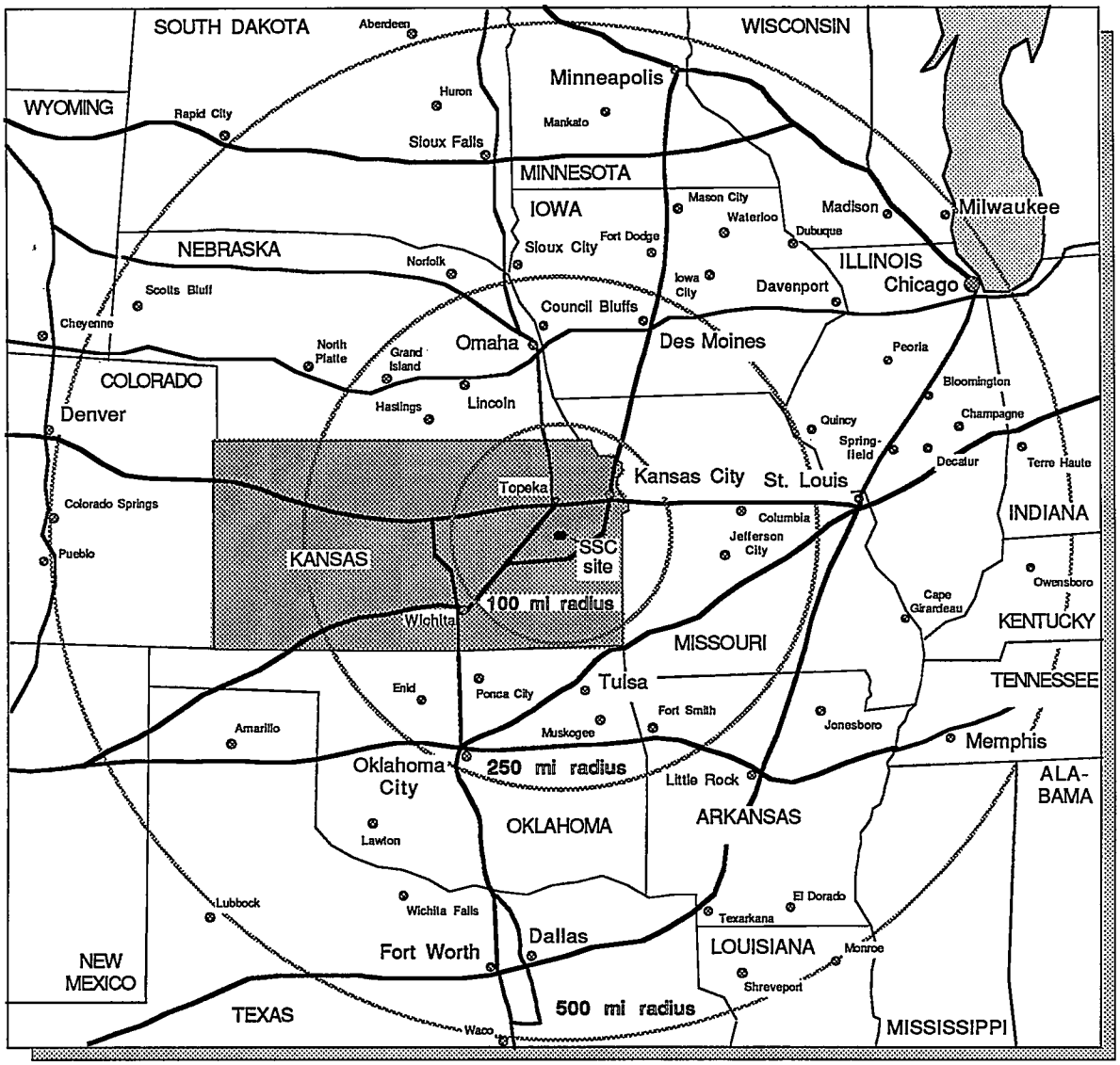


FIGURE 1.1--PROPOSED SITE FOR THE SUPERCONDUCTING SUPER COLLIDER IN KANSAS AND CITIES WITHIN A 500-MILE RADIUS.

State will acquire easements for temporary use or, at the option of the DOE, acquire and convey fee simple title to the Department.

2. Also offered is fee simple title to 1,166 acres of additional land beyond the requirements of the ISP, which will be acquired and conveyed to the DOE at the Department's option. These additional acres are adjacent to the land required by the facility and may be desirable to the Department because of the relationship of the Kansas site plan to local topography and transportation infrastructure.

3. To insure that construction can proceed without delay, Kansas will upgrade and improve the existing network of State and local roads needed to support construction and facility access adjacent to and within the ring. Upon completion, all roads needed for facility access will be surfaced or resurfaced for permanent use.

4. At the option of the Department, Kansas will provide access at the site to a high-quality municipal and industrial water supply, thus eliminating or minimizing the need for on-site treatment.

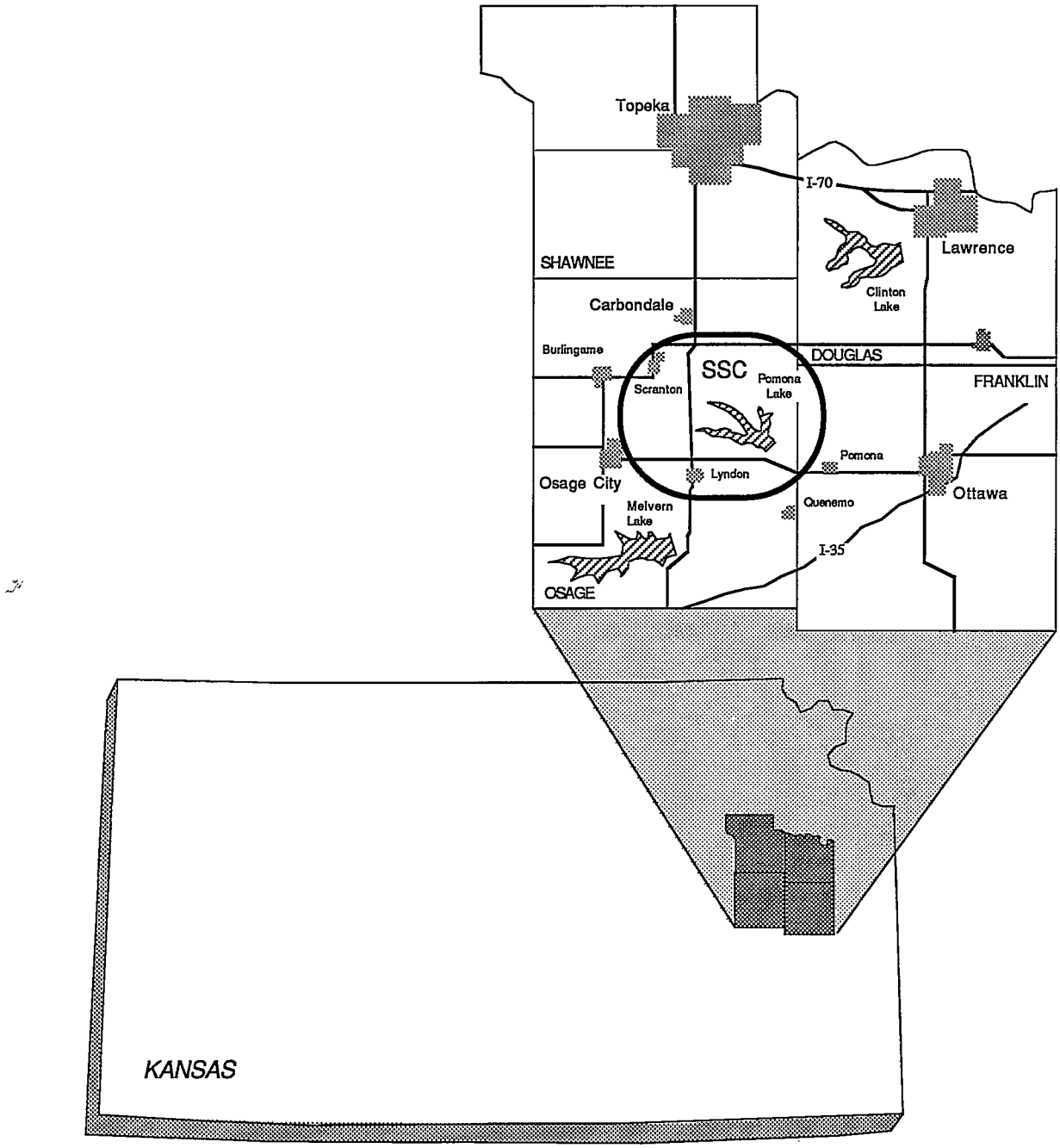


FIGURE 1.2—LOCATION OF PROPOSED SSC SITE WITHIN FOUR-COUNTY AREA OF NORTHEAST KANSAS.

5. Kansas provides a long-term commitment of unsubsidized low-cost power supplied through the combined capacity of the state's two largest electric utilities. Service certifications and rate schedules for use by the SSC have been approved by the Kansas Corporation Commission.

6. Kansas has an SSC Project Office established by Executive Order of the Governor and located within the Kansas Department of Commerce. This office, staffed with appropriate State personnel, will provide continuing contact and assistance with State regulatory and permitting agencies, local governments and citizens, and labor and business groups on behalf of the DOE and its contractors. It will also coordinate land acquisition, road construction and maintenance, and utility construction with DOE's SSC project management.

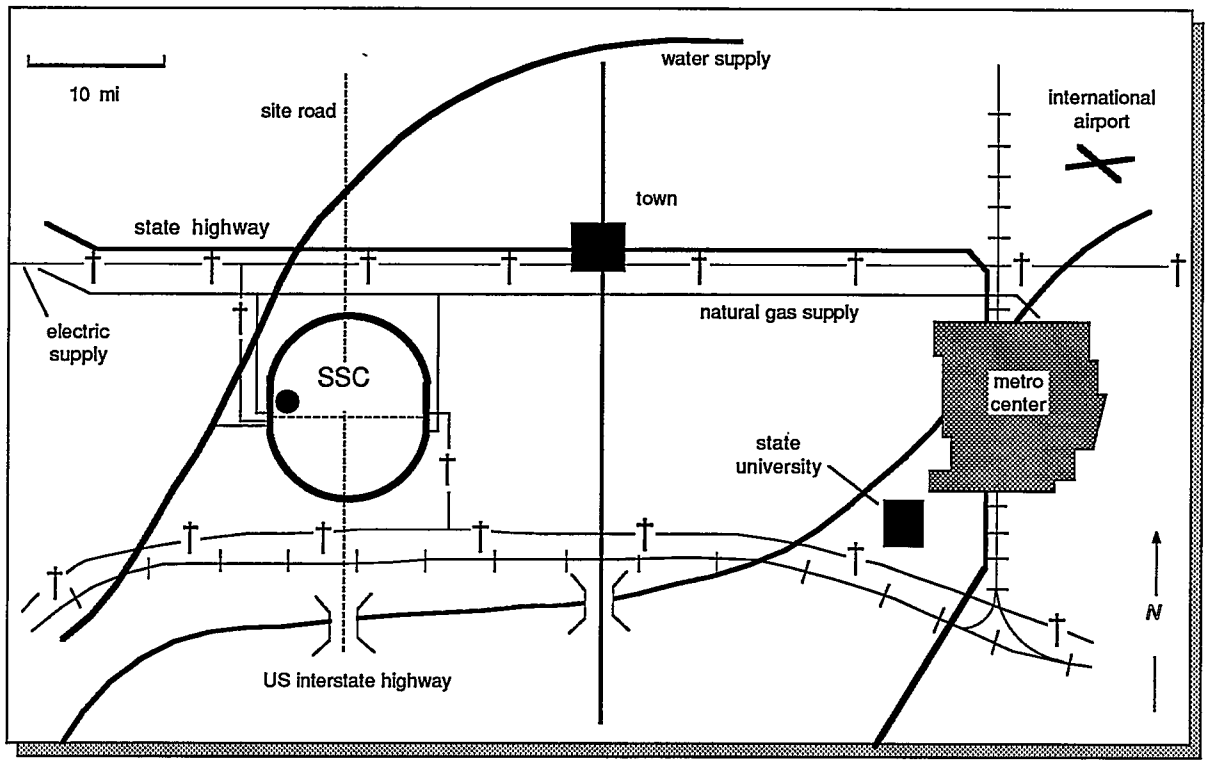


FIGURE 1.3--DOE CENTRAL DESIGN GROUP'S IDEALIZED CONCEPTUAL SITE OF THE SSC.

SUPPORTING INFORMATION

The elements of Kansas' proposal included in Volumes 3 through 8 are fully documented as required by the Invitation for Site Proposals. Where options are given, the proposal utilizes maps (plates), figures, and tables of the appropriate scale and detail to most clearly demonstrate the points being addressed.

Wherever possible, data that provide the objective basis for narrative statements are included in appendices. Where data inclusion was deemed impractical, sources are identified in the text or documented by footnotes and other appropriate references.

The Kansas proposal is characterized by the inclusion of documentation demonstrating final action on decisions, State commitments, and legislative and gubernatorial actions. An important goal of the Kansas proposal is to assure the DOE that it can rely on the State's commitments.

Appendices to Volumes 2, 4, 6, and 8 contain reproductions of documents of official State actions including legislation providing eminent-domain authority for the Kansas Secretary of Commerce, utility-service certification authority for the Kansas Corporation Commission, and advance appropriation of the funds necessary to purchase land; Executive Order 87-98, establishing the Kansas SSC Project Office and Coordinating Committee; and other project-related orders issued by the Corporation Commission.

Similarly, copies of all legal documents that would be used to effect land purchase and title transfer, together with copies of relevant statutory and regulatory provisions, are included in the appropriate appendices.

QUALIFICATION CRITERIA

Kansas' proposed site meets all qualification criteria. The proposed location of the Superconducting Super Collider is entirely within the United States of America. This fact is demonstrated in Section 6.1.1, wherein the center of the collider-ring oval (coordinates X = 100,000, Y = 100,000) is located longitude 95°38'3" west and latitude 38°41'51" north, with the collider ring having an east-west orientation.

The land size and configuration of the proposed site meet or exceed the requirements of Figure 1-2 and Table B-1 of the Invitation for Site Proposals for each land-use category. This fact is demonstrated in Section 2.1.6.

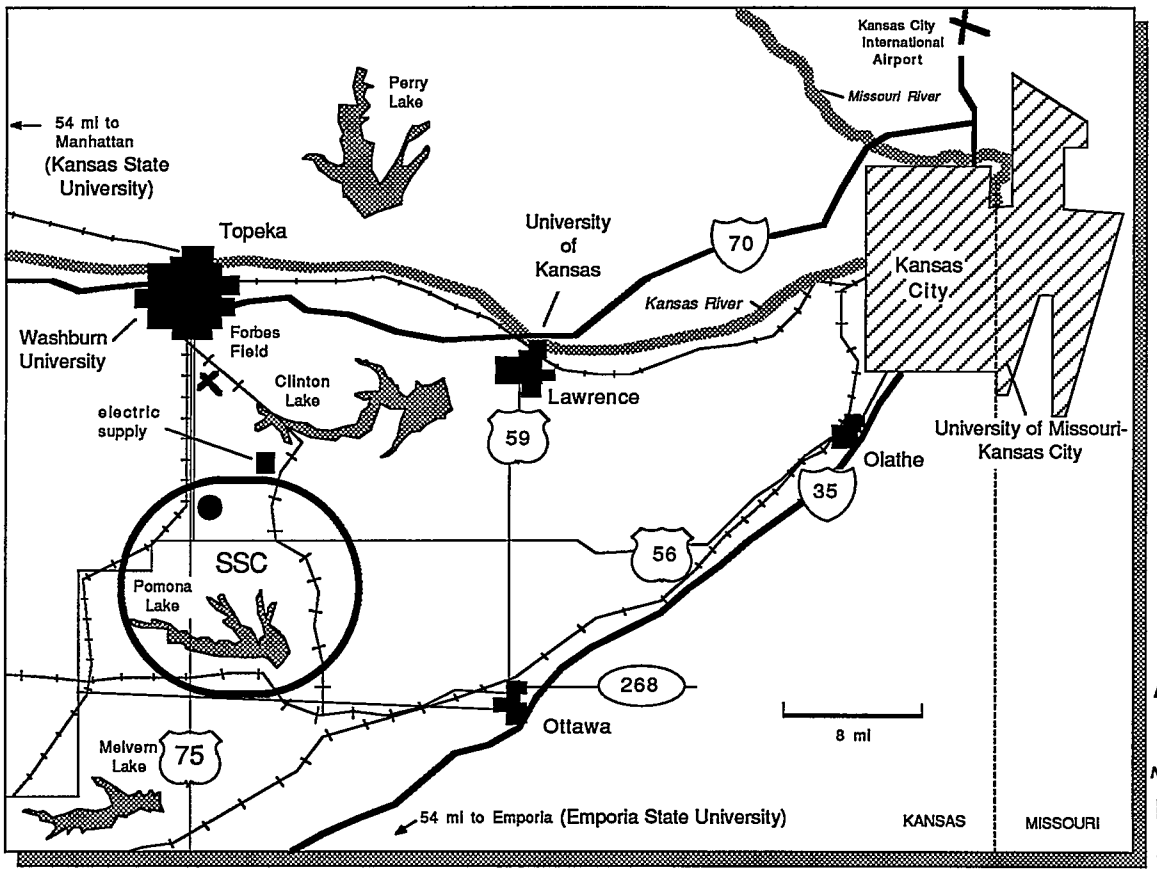


FIGURE 1.4—KANSAS PROPOSED SITE FOR THE SSC.

All cost in acquiring the land offered to the United States of America in Volume 2 shall be borne by the State of Kansas, including cost incurred in compliance with PL 91-646, payment of fair market value as determined by negotiation or exercise of the State's power of eminent domain, provision of title insurance in the name of the United States of America in like amount, and the cost of all title curative work to provide title to said estates satisfactory to the Attorney General of the United States of America.

The Kansas Corporation Commission has designated the state's two largest electric utilities, each with sufficient capacity to meet the qualification of the Invitation for Site Proposals, to serve the project. Section 8.1 demonstrates the commitment of at least 200 MW of electrical power for the SSC Project.

Industrial water supply in the amount of 2,200 gallons per minute is available and committed to serve the project as is demonstrated by Section 8.2.

The extensive investigation by the State's departments of Health and Environment, Wildlife and Parks, Geological Survey, and Biological Survey in the process of preparing this bid has revealed no unacceptable impacts from siting, constructing, operating, and decommissioning the Superconducting Super Collider. Sections 3.3.2, 5.3.2, 5.4.2, 5.7.1, and 5.8 demonstrate this point.

The State of Kansas will comply with the Relocation Assistance and Real Property Acquisition Policy Act of 1970, as that Act has been implemented by regulations of the Department of Energy. This fact is demonstrated by the Acquisition Plan detailed in Section 6.2.

TECHNICAL EVALUATION CRITERIA

Geology and Tunneling

The topography of the site is predominantly gently rolling upland with moderate slopes adjacent to the stream valleys. The maximum difference in elevation from the high points on the uplands to the stream beds is about 270 feet.

Geologic formations underlying this mature topography consist of very gently westward-dipping units of alternating limestones, shales, and sandstones deposited about 285 million years ago, during the late Pennsylvanian

Period. The beds are relatively uniform in composition throughout the site and have been only mildly deformed by tectonic stresses, mainly during and shortly after their deposition. As a result, these layered sedimentary-rock units are suitable for rapid underground excavation using relatively common and proven soft-rock tunnel-boring machines and similar equipment.

The depth of the main tunnel, constructed on a horizontal plane, will range from 50 feet beneath river valleys to 320 feet below the highest part of the topography. The average depth of the 20 main shafts is 220 feet. At those depths, the effects of the SSC on the surface environment are minimal, and the effects of the surface environment such as weather and vibrations are minimal at tunnel level. A terrain-following or upward-tilted tunnel profile is feasible and could be considered as an alternative, but the complexities of alignment offset the decrease in shaft and tunnel depths that could be attained.

The few negative effects that are unavoidable, such as the disposal of tunnel spoils and any mineralized water that might be encountered in underground construction, can be handled so that they have a beneficial impact on the area.

Excavated spoils will be used to reclaim abandoned limestone quarries in the area. Any produced water from construction can be collected in lined ponds at the service-access shaft sites where the water, if suitable, can be used for dust control during construction or for irrigating newly planted vegetation. If the water is unsuitable, it can be hauled to approved deep-disposal wells near the north and south clusters. These same ponds and wells can be used later during the operation of the facility to collect and dispose of blow-down water from cooling towers and water-treatment effluent.

Because the necessary transportation and utility infrastructure is already available at the site, especially at the campus area and at the shallowest part of the tunnel, construction can begin quickly. By assembling several tunnel-boring machines at the surface at the rail- and highway-access point located near the shallowest depth of the tunnel, these machines can bore quickly to grade and make an early start on one-quarter of the main tunnel.

The proposed depth of the tunnel and the rapid excavation and lining methods that are suggested preclude subsidence at the surface. The stable geologic and tectonic setting of the region in the interior of the Midcontinent is confirmed by the extremely low earthquake risk assigned to it by the U.S. Geological Survey and the Kansas Geological Survey, which operates a micro-earthquake network in the region. A careful assessment of the site revealed no other features or phenomena that could seriously affect the operation of the facility.

Except for its greater tunnel depth, the Kansas proposed site almost exactly matches the Central Design Group's conceptual site; its underground construction orientation and would require the same construction methods used to develop the soft-ground tunneling estimates. However, because of its simpler geology, the horizontal orientation of the tunnel plane, the immediate availability of transportation infrastructure, and lower labor and internal costs, the proposed site should be more efficient and less costly to build than the conceptual model.

Regional Resources

The State of Kansas' proposed site is within 16 miles of the state's capital city of Topeka, 36 miles from Lawrence, location of the University of Kansas, and an hour from the metropolitan Kansas City area. These communities and numerous smaller towns in the vicinity of the facility offer a range of supporting resources for the SSC's work force.

The SSC's staff and their families can choose urban, suburban, or rural lifestyles and affordable housing within reasonable commuting distance of the campus. Recreational options abound and cultural opportunities are readily available, particularly in Kansas City, which supports diverse museums and first-quality performing arts.

A well-educated, skilled workforce with recent experience in high-technology heavy-works construction is available to the project as are the natural and manmade resources needed to support conventional-facilities construction.

Kansas invests heavily in its elementary and secondary education system and ranks well above national averages in all comparable measures of educational investment and achievement.

General and specialized medical facilities are readily accessible to the site and surrounding communities, and the region has a well-developed emergency response system. Seventy-four hospital facilities with over 13,000 beds are within 100 miles of the site. Twenty-four-hundred beds are located in Topeka.

Employment opportunities in business, light industry, government, education, technology, and research are available within the region. The primary direction of growth and development along both the Interstate 70 and Interstate 35 corridors is toward the site location. Growth in high-technology-related industries is robust and complements the region's existing base.

The region is well served by highways, air, and rail. The site is bracketed by Interstates 70 and 35 and bisected by U.S. Highways 75 and 56. The campus area is already accessible by a four-lane divided highway connecting it to Interstate 70 and the 12,000-foot runway at Topeka's Forbes Field. It is served internally by an existing network of all-weather county roads which provide access to all points along the ring for both construction and operational purposes. Kansas City Interna-

tional Airport is served by 14 airlines and is well designed and easy to use. Topeka's Forbes Field, while not currently served to full capacity, enjoys a new passenger terminal, runway capacity to handle all commercial aircraft, and is immediately accessible to the communities in which many staff and their families would likely live.

Rail lines crisscross the site and provide access for heavy equipment to both the proposed main campus and far cluster areas. Rail service intersects both Topeka's Forbes Field and nearby Missouri River barge facilities.

Local citizens and political leaders have been well informed about the project through extensive public hearings. Community support is strong and local governments have adopted resolutions in favor of the project. The State of Kansas has and will continue to work closely with affected local governments to coordinate road improvements, community planning, and service delivery. The State has established an SSC coordinating office to provide continuing support to the DOE and its contractors.

Environment

Environmental impacts from siting, constructing, operating, and decommissioning the SSC in Kansas will be minimal. Plans and necessary intergovernmental agreements needed to mitigate impacts have already been finalized.

Because the SSC ring and interaction halls will be below ground, the impact upon local topography will be limited to landscaping for surface buildings and construction of holding ponds for modest amounts of pre-treated water. The region's overall aesthetics will be improved by the reclamation of 608 acres of strip mines and quarries, which would be used to dispose of tunneling spoils.

Geological resources will not be affected as they occur well below the proposed level of the collider ring (i.e. oil and gas) or do not exist in significant quantities (i.e. coal).

Of the 7,863 surface acres of land provided in fee simple, only 720 acres would be directly affected by surface construction. Eight acres of poor-quality native prairie would be destroyed, and 3,420 acres of prime farmland (as defined by soil type) would be taken out of production.

Most surface-water features on the site would be unaffected by construction, provided proper waste-disposal techniques are used. Should the Department exercise its option to utilize Pomona Lake for water supply, its level would be impacted during a severe drought.

The proximity of Strowbridge Reservoir to the campus makes it vulnerable to degradation during construction and operation. The use of retention ponds as suggested in the Kansas site-design proposal is intended to reduce this impact to acceptable levels. Should it become necessary to replace the reservoir as the City of Carbondale's water-supply source, it is expected that the lake's recreational uses would be unaffected. Agreement has been reached between the State and the city regarding water-supply replacement options.

It is likely that water quality in both Strowbridge Reservoir and Osage County State Fishing Lake would improve after construction of the SSC, as significant portions of the lakes' watersheds would be removed from agricultural activity, thus reducing concentrations of suspended solids, nutrients, and pesticides in the runoff that enters these lakes.

Wildlife habitat lost to surface construction for the SSC would be offset by improvements in the habitat quality on the remaining land owned by DOE. The habitat lost by filling in the strip mines and quarries with tunneling spoils will be replaced through reclamation. No threatened or endangered species of plants or animals and no wetlands would be impacted by the SSC.

The health and safety of the general public should not be significantly impacted by the SSC. Increase in risk of exposure to radiation could come from transport of low-level radioactive waste off-site. This risk is minimal because of the high-quality existing road system and low population density. These factors also minimize the increased risk of traffic accident due to greater vehicular density generated by the SSC.

Air quality near the site could suffer slightly because of an increase in suspended particulates generated by construction activity. During operation, suspended particulates might be reduced if land is removed from agricultural activity; the small amount of combustion-type emissions from the SSC would have no impact because of the area's high-dispersion factor.

The area around the SSC will experience a slight increase in noise due mainly to increased vehicular traffic. The impact of this increase would be minimal because of the low population density and small number of noise-sensitive receptors.

No known archeological sites would be affected by the SSC. However, several structures that are potentially eligible for listing on the National Register of Historic Places exist in the campus, injector, and future expansion area. An active cemetery exists near the middle of the injector area.

Insofar as adverse environmental impacts are projected to be minimal, the State of Kansas and affected local governments anticipate no difficulty meeting applicable environmental and safety requirements. On the basis of substantial and continuing communication with interested local and statewide environmental organizations during proposal preparation, no significant opposition or litigation is anticipated.

In the few cases where adverse environmental impacts have been identified, appropriate plans for the implementation of mitigation actions have been made.

Setting

The topography of the site is characterized as nearly level to gently rolling, and the geological and surface features, natural and human-made, will not hinder slight adjustments to the proposed location of the SSC facilities. The State stands willing to assist the DOE during the final site selection in identifying additional properties, should this be necessary.

The State of Kansas' proposed site will lend itself well to the interests of the DOE in moving swiftly to get the project underway. The proposed site plan identifies 409 tracts but only 303 landowners. Because the process of survey and the development of a plan are scheduled to begin upon designation to the Best Qualified List, some adjustments may be made during final siting without delaying the delivery of title.

The State's SSC Project Office has been assured access to the staffs of the two electric utilities involved in the proposal, the State Department of Transportation's acquisition staff, and a number of retired attorneys from the U.S. Army Corps of Engineers who reside in the area and have considerable experience with P.L. 91-646. Finally, the State's condemnation-procedures statutes make Kansas a "quick take" state. These facts enhance the State's ability to deliver title to the acquired property with reasonable flexibility on time.

Regional Conditions

Few, if any, human-made disturbances will possibly affect the operation of the SSC facility at the proposed Kansas site. The rural setting and the proposed depth of the tunnel and interaction halls will mitigate, to a large degree, the effects of surface vibrations and noise caused by human activities. The Kansas climate, though variable, should not present any difficulties for the construction and operation of the SSC facilities.

Utilities

Electrical service for the SSC is available from the state's two largest utilities. Kansas Power and Light (KPL) would provide service to the north feed and Kansas City Power and Light (KCPL) would serve the south substation. Each utility individually has generating capacity at least 12 times the SSC's power requirements. The two utilities are also members of both the Southwest Power Pool and the MOKAN Power Pool, which adds to the stability and reliability of the regional grid. Arrangements concerning the provision of electrical service and rate structure for the SSC have already received the approval of the Kansas Corporation Commission, the State's public-utility regulator.

Two independent options are available to the DOE for the provision of both potable and industrial water to the SSC site. The City of Topeka is prepared, in cooperation with the State of Kansas, to extend its water service to the SSC site. Alternatively, facilities can be constructed to bring water from Pomona Lake to the SSC site. Each option can easily meet the reliability, quality, and quantity requirements of the facility.

Natural gas and competitively priced electricity are available to meet the heating and air-conditioning needs of the facility. County-operated and commercial landfills and disposal operations are located in the area with the capacity to serve the SSC. Sewage disposal will be addressed according to the Central Design Group's plan for an on-site sewage-treatment plant.

Summary

In short, the State of Kansas offers the Federal government a site characterized by geological stability; ease of tunneling and efficient, on-site spoils disposal; low-cost water and electric power; well-developed air, rail, and highway transportation infrastructure with current excess capacity; a wide range of lifestyles in mature communities; a hard-working, able labor force; and the full and enthusiastic support of the population and its political leaders.

Site Proposal for the Superconducting Super Collider

Kansas

Volume 2

Offer, Financial and Other Incentives, and Other Documents

For more information, contact:

SSC Project Office
Kansas Department of Commerce
400 W. 8th, Suite 500
Topeka, Kansas 66603
(913) 296-5272

Cover art from the original painting "*Explosion of Creation*" by Kansas artist Philomene Bennett

Cover design by Jennifer Sims, Kansas Geological Survey

Table of Contents

2.1 OFFER OF REAL ESTATE 1
2.1.1 Transfer of Title to the United States of America 1
2.1.2 Rights of Entry 1
2.1.3 Compliance with Federal Acquisition Laws 1
2.1.4 Land Acquisition Authority 2
2.1.5 Exemption 2
2.1.6 Estates 2
2.1.7 Existing Improvements 4
2.2 THE OFFER OF FINANCIAL AND OTHER INCENTIVES 4
2.3 QUALIFICATION CRITERIA 5
2.4 SCHEDULE 7

Table

2.1—Estates being offered 3

Appendices

1—Offer to Donate Real Property to the Federal Government
2—K.S.A. 58-2223b
3—1987 Session Laws of Kansas, Chapter 327
4—Laws Concerning Eminent Domain
5—K.S.A. 17-1350
6—K.S.A 82a-708b
7—General Warranty Deeds
8—K.S.A 68-102
9—Matrix of Disposition of Structures on SSC Properties

Volume 2—Offer, Financial and Other Incentives, and Other Documents

2.1 OFFER OF REAL ESTATE

2.1.1 Transfer of Title to the United States of America

The State of Kansas will execute Offers to Donate Real Property to the Federal government in the form provided in Appendix G of the DOE's ISP as amended (appendix 1, volume 2) on the dates provided in the schedule in Section 2.4, consistent with the priority established in the acquisition plan detailed in Section 6.2, unless the dates or priorities for transfer are changed by the DOE to be site specific. Paragraph (4) of the "offer" has been changed to delete reference to the "documentary revenue stamp tax," which is not applicable in Kansas. "Certificates of Value," used in place of the documentary revenue stamp tax, is not required for conveyance to the United States of America or the State of Kansas, K.S.A. 58-2223b (appendix 2, volume 2). The entire proposed site is located within the State of Kansas, United States of America. No Federally owned, or controlled, land is involved in the Kansas proposed site.

Title to all estates will conform to the guidelines of the Attorney General of the United States, "Standards for the Preparation of Title Evidence in Land Acquisition by the United States." Commitment for title insurance insuring title in the United States in the amount of fair-market-value purchase price and survey of the lands offered for donation will be proffered with the offer to donate land for each segment as directed by DOE pursuant to Section 2.4 of the ISP. Final policy of title insurance will be provided following curative work, if any is required. All of the above will be done at no cost to the United States.

2.1.2 Rights of Entry

The Kansas Legislature 1987 Session Laws of Kansas, Chapter 327, at Section 1(f) provide, "The secretary may enter or authorize designees to enter upon any property to make surveys, examinations, investigations and tests and to acquire other necessary and relevant data in contemplation of the acquisition of land or rights in land pursuant to this section. Prior to entering upon any such property the secretary or designee shall first request permission of the landowner. Where consent to do the things authorized in this subsection (f) is not given to the secretary or designee by the owner or occupant of the land involved, the secretary or designee may proceed as authorized after giving 10 days' written notice to landowner or occupant of the secretary's or designee's intention to conduct such surveys, examinations, investigations and tests. Entry upon any property, pursuant to this subsection (f) shall not be considered to be a trespass and no damages shall be recoverable solely because of such entry."

The right of entry is hereby expressly extended to the DOE and its contractors for the entire site as proposed herein during the proposal evaluations and EIS preparation periods, and the right extends until title is conveyed to the Federal government. The rights extended hereunder by designation may be utilized by the designees at no cost to the United States.

The rights granted hereby shall terminate at any time Kansas is excluded from project selection. As considered under this section, that shall mean failure to be designated for the BQL (Best Qualified List) or by the award of the project to a proposer other than the State of Kansas.

2.1.3 Compliance with Federal Acquisition Laws

The acquisition plan detailed in Section 6.2 of this proposal provides assurance that the State of Kansas has assembled a team and obtained commitment from individuals experienced in acquisition under the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970. The combined experience of the proposed 36-person acquisition team is 295 years. These individuals represent a coordinated and cooperative effort including the Kansas Department of Transportation, the principal Kansas acquisition agency under P.L. 91-646; private industry, which has personnel experienced in P.L. 91-646; and contractors recently retired from the U.S. Army Corps of Engineers, Kansas City District.

Acquisition for this project will fully comply with P.L. 91-646. Appraisals will be made consistent with the Uniform Appraisal Standards for Federal Land Acquisition. Acquisition will be guided by "A Procedural Guide for the Acquisition of Real Property by Government Agencies" (Department of Justice, Land and Natural Resources Division).

2.1.4 Land Acquisition Authority

Full copies of existing legislation under which acquisition and condemnation for the SSC is authorized have been included in appendix 3, volume 2.

The 1987 Session Laws of Kansas, Chapter 327, gave the Secretary of Commerce, State of Kansas, full power to acquire fee simple title or easements by gift, purchase, or by the exercise of the right of eminent domain to both surface and subterranean tracts for the SSC. The statute provides that the Secretary can acquire land and rights in land for all of the ancillary purposes required for development of the SSC.

The statute authorizes the Secretary to acquire uneconomic remainders. It provides that with reference to easements and stratified fee estates, oil and gas or other minerals may be subordinated but not taken. With reference to fee simple acquisition, the Secretary may acquire oil, gas, and other minerals.

The exercise of eminent domain is provided by K.S.A. 26-501 et. seq. (appendix 4, volume 2). This is an administrative proceeding conducted by the courts of general jurisdiction in Kansas. The proceeding is an in rem proceeding and is begun by the filing of a petition setting out the right of the plaintiff to take the estates identified. Notice of the proceeding is given by certified mail and by publication to all owners. At the first hearing the District Court Judge considers the allegations of the petition and if the judge finds on its face, with evidence, that they meet the requirements of statute then the judge appoints three disinterested householders in the county to serve as appraisers. The District Court Judge instructs the appraisers concerning the nature of matters into which they may inquire. The appraisers are then required to conduct a hearing for the purpose of receiving statements from the parties, view the property, make appraisals, and file their report with the District Court, all within 20 days. The time may be extended by the judge. The entire procedure can be completed in as little as 30 days but typically requires 50 to 60 days.

Since the procedure is administrative in nature, objections must be made by collateral attack.

The condemnation is complete when the condemnor pays the award of the court-appointed appraisers into court by deposit with the Clerk of the Court. Title passes with this deposit. Either party may appeal the award for trial de novo, but the only issue is that of just compensation.

Throughout the procedure, the owners of records and tenants are provided notice of the proceedings.

With reference to the 10-acre cemetery located in Area B, Kansas law requires that a substitute facility be provided. The cemetery will be relocated unless the DOE directs that it can remain with limited and controlled access. The cemetery district, the owner of the property, may elect to remain in existence and have the cemetery relocated, or it may elect to dissolve pursuant to K.S.A. 17-1350 (appendix 5, volume 2).

Strowbridge Reservoir is a municipal water-supply lake serving the City of Carbondale. Transfer of the Certificate of Appropriation together with change of use from municipal to recreation is authorized by K.S.A. 82a-708b (appendix 6, volume 2).

2.1.5 Exemption

No portion of the proposed Kansas site is owned by either the State of Kansas or the United States of America. Title will be acquired from private individuals, corporate entities, partnerships, and municipalities consistent with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (P.L. 91-646), as implemented by regulation.

This section is therefore not applicable.

2.1.6 Estates

The estates being offered to the United States of America pursuant to this proposal are General Warranty Deed Fee Simple Estate, General Warranty Deed Stratified Fee Estate, General Warranty Deed of Easement Access Road Easement, General Warranty Deed of Easement Spoil Area Easement, General Warranty Deed of Easement Surface Utility Easement, and General Warranty Deed of Easement Mobilization and Storage (appendix 7, volume 2).

Stratified Fee Estate as understood in this proposal is

> A stratified fee simple estate to a subterranean volume of space described as that volume of space lying between 815 feet mean sea level and 915 feet mean sea level which is 500 feet horizontally either side of a line at 865 feet mean sea level which line enters the above described surface tract at a point "A" feet (east, west, north, south) of the "B" corner of said tract, which line thence proceeds along an arc to the right with a radius of 38,717 feet and exits said tract at a point "C" feet (east, west, north, south) of the "D" corner of said tract.

As to each acquisition of a stratified fee estate, the surface-tract description from which the estate is to be acquired will first be stated by reference to section, township, and range.

The estates being offered compare to the DOE's ISP Figure 1-2 and Table B-1 as shown in Table 2.1.

The acreage-size and location of the estates were established by overlay of the template Figure 1-2 of the ISP over the U.S. Geological Survey 7-1/2-minute

TABLE 2.1—ESTATES BEING OFFERED BY THE STATE OF KANSAS FOR THE SSC SITE COMPARED TO THE ISP REQUIREMENTS.

Area	Letter designation	ISP requirement/acres	Kansas offer/acres
Campus	A	350 F.S.*	355 F.S.*
Injector	B	1,700 F.S.	1,712 F.S.
Future expansion	C	1,450 F.S.	1,456 F.S.
Upper/lower arcs	D	3,790 S.F.**	3,868 S.F.**
Intermediate access	E	6 F.S.	6 F.S.[a]
		(0.9/site)	(1.0/site)
Service areas	F	34 F.S.	36 F.S.[a]
		(5.7/site)	(6.0/site)
Near cluster	G	2,010 F.S.	2,023 F.S.
Far cluster	H	1,540 F.S.	1,595 F.S.
Far cluster bypass	N/A	440 F.S.	440 F.S.
Abort/external beams	I	4,550 S.F.	4,567 S.F.
Abort/external beam access	J	240 F.S. (40/site)	240 F.S.[b]
Interaction points	K	incl. in areas G & H	
Overhead utility easement	N/A	N/A	374 E***
Mobilization and storage easement	N/A	N/A	160 E***

* Fee simple estate
** Stratified fee estate
*** Surface easement
[a] Acreage also included in area
[b] Acreage also included in areas G and I

quadrangle sheets of like scale. The dimensions for each area of the project were then taken from Table B-1 of the ISP. Plates 6.2 and 6.3 and Figure 6.6, Section 6.2.1.4, and Table 2.1 set forth above clearly indicate compliance with the requirement that the estates conform to Figure 1-2 and Table B-1 of the ISP. The additional available land being offered the Government herein, located adjacent to areas A, B, C, and G, adds site flexibility.

To develop the site and to provide four-lane highway access to the campus area, the State proposes to acquire 88 acres of highway easement on which it will construct a State highway. This highway will be owned and maintained by the State of Kansas to the property boundary of the project, at which point access may be restricted by the Federal government.

A 100-foot-wide surface-utility easement will be acquired for construction of the 69-kV overhead power line to provide electric power to the Intermediate Access and Service Areas as proposed in Section 8.1. This easement is acquired at the surface above the stratified fee estate and is offered to the Federal government. If the Government accepts the alternate proposal made in Section 8.1 concerning ownership and operation of this power line, the easement will be transferred to the electric-utility companies authorized to serve the project.

The rights of third parties in and to the proposed estates will all be extinguished with the exception of oil, gas, and other mineral rights in the easement and stratified fee estate areas. These interests will be subordinated to the Superconducting Super Collider Project.

Existing county and township roads located in areas A, B, and C, and the additional land, if accepted by the Federal government, will be closed pursuant to K.S.A. 68-102 et seq. (appendix 8, volume 2). Those roads will then become the private, internal road network of the project.

Easements are not required for the utilities in the areas proposed for fee simple acquisition and transfer to the Federal government. The lines constructed will be service lines, which in Kansas are authorized by the application for utility service. The lines will be located as directed by the Federal government. Any additional cost associated with the location of these lines in a manner other than as proposed by the several utility companies will be borne by the State of Kansas or the utility company pursuant to agreement between them.

The estates being offered herein are without exception or reservation in favor of the State of Kansas.

2.1.7 Existing Improvements

A total of 67 tracts, which have improvements qualifying for relocation assistance, will be acquired for the proposed site. Thirty-six of those tracts have improvements which have value to the SSC project during construction and operation. The locations of those improvements are shown on Figure 6.6. The narrative in Section 6.2 of this proposal and the matrix (appendix 9, volume 2) identify the potential use at each location. Houses have value for construction offices and security offices during construction and as staff housing or security offices during the operation phase of the project. Barns and other buildings now used in agriculture have value for equipment and material storage both during and after construction. The barns and other buildings have unique applicability to maintenance. The SSC Project Office, Kansas Department of Commerce, has a complete set of photographs showing all improvements discussed herein.

Demolition of buildings will be coordinated with the Federal government. No building, whether identified for project use or not, will be demolished until the DOE is given opportunity to direct otherwise through the offer to transfer, executed consistent with Section 2.4. in the ISP.

2.2 THE OFFER OF FINANCIAL AND OTHER INCENTIVES

Deleted according to DOE instructions.

Kansas Geological Survey

Open File Report 1987-22, Volume #2

Missing Pages #5-6

2.4 SCHEDULE

The State of Kansas will deliver title to all estates on the dates established by the ISP. Offers to transfer title and actual transfer of title will be consistent with the schedule published in the ISP, either as modified by the site-specific acquisitions proposal in Section 6.2 or as provided by the DOE. The acquisition plan detailed in Section 6.2 provides for the purchase of options to buy land which will allow for delivery of approximately 100 acres, with improvements, located in Area A to DOE on January 1, 1989. Cooperation of the Federal government will be required in this regard to assure that the notice requirement of the Relocation Assistance and Real Property Acquisition Policy Act is followed. The delivery of this acreage precedes award of the project. Written request for delivery of the 100-acre site should be directed to the Secretary of Commerce.

Transfer of title to Ridgeway Cemetery is discussed in Section 6.2.3.9. The State of Kansas does not anticipate a delay in the transfer of title or delivery of possession to this 10-acre tract. Because of the special nature of cemetery property, we address it here to comply with the June 24, 1987, letter of Mr. Wilmot N. Hess, Chairman, SSC Site Task Force.

Volume 2

Appendix 1—Offer to Donate Real Property to the Federal Government

OFFER TO DONATE REAL PROPERTY TO THE FEDERAL GOVERNMENT

The undersigned, hereinafter called the Donor, in consideration of the mutual convenants and agreements herein set forth, offers to donate to the United States of America and its assigns, the fee simple title to the following described land, with the building and improvements thereon, and all rights, hereditaments, easements, and appurtenances thereunto belonging, located in the County(ies) of _____, State(s) of _____ bounded and described as follows: _____

_____

subject to the following rights outstanding in third parties: _____

_____

Excepting and reserving only the following rights and interests in the above described property: (namely) _____

_____

The terms and conditions of this offer are as follows:

(1) The Donor agrees that this offer may be accepted by the United States through any duly authorized representative, by delivering, mailing, or telegraphing a notice of acceptance to the Donor at the address stated below, at any time within three (3) months from the date hereof, whereupon this offer and the acceptance thereof become a binding contract.

(2) The United States of America agrees to accept said land from the Donor upon acceptance of this offer and approval of the Donor's title; provided the Donor can execute and deliver a good and sufficient general warranty deed conveying said land with the hereditaments and appurtenances thereunto belonging to the United States of America and its assigns, in fee simple, free and clear from all liens and encumbrances, except those specifically excepted or reserved above, together with all right, title, and interest of the Donor in and to any streams, alleys, roads, streets, ways, strips, gores, or railroad rights-of-way abutting or adjoining said land.

(3) It is agreed that the Donor will pay all expenses incident to the preparation and recordation of the deed to the United States and the procurement of the necessary title evidence, which evidence shall be in a form acceptable to the United States of America.

(4) The Donor agrees that all taxes, assessments, and encumbrances which are a lien against the land at the time of conveyance to the United States shall be satisfied of record by the Donor at or before the transfer of title and, if the Donor fails to do so, the United States may pay any taxes, assessments, and encumbrances which are a lien against the land; that the amount of any such payments by the United States shall be reimbursed by the Donor; that the donor will, at the request of the

United States and without any payment, execute and deliver the general warranty deed to the United States, pay all filing fees and taxes as required by law, and obtain and record such other curative evidence of title as may be required by the United States.

(5) The Donor agrees that loss or damage to the property by fire or acts of God shall be at the risk of the Donor until the title to the land and deed to the United States have been accepted by the United States through its duly authorized representative or until the right of occupancy and use of the land, as hereinbelow provided for, has been exercised by the United States; and, in the event that such loss or damage occurs, the United States may, without liability, refuse to accept conveyance of the title or it may elect to accept conveyance of title to such property, as the United States deems appropriate.

(6) The Donor agrees that the United States may acquire title to said land by condemnation or other judicial proceedings, in which event the Donor agrees to cooperate with the United States in the prosecution of such proceedings; agrees that any and all awards of just compensation that may be made in the proceeding to any defendant or interested party shall be reimbursed to the United States; agrees that the said consideration shall be in full satisfaction of any and all claims of the Donor for payment of the right of occupancy and use hereinafter provided for in paragraph 7.

(7) The Donor hereby grants to the United States the right of immediate occupancy and use of the land for any purpose whatsoever from and after the acceptance of this offer until such time as said land is conveyed to the United States and, upon demand, the Donor will immediately vacate the property or insure vacation by any other party and deliver possession to the United States.

(8) In the event that either the Superconducting Super Collider is not built on the property covered by this offer or the scope of the project is so reduced that a portion of the site is not required, the property covered by this offer, or any appropriate portion thereof, may revert to the Donor provided, permanent improvements have not been constructed by the United States. Upon written mutual agreement of the facts stated above, the reversion shall occur at no cost to the Government.

(9) It is agreed that the spouse, if any, of the Donor, by signing below, agrees to join in any deed to the United States and to execute any instrument deemed necessary to convey to the United States and to execute any instrument deemed necessary to convey to the United States any separate or community estate or interest in the subject property and to relinquish and release any dower, courtesy, homestead, or other rights or interests of such spouse therein.

(10) The Donor represents and it is a condition of acceptance of this offer that no member of or delegate to Congress, or resident commissioner, shall be admitted to or share any part of this agreement, or to any benefits that may arise therefrom; but this provision shall not be construed to extend to any agreement if made with a corporation for its general benefit.

(11) The terms and conditions aforesaid are to apply to and bind the heirs, executors, administrators, successors, and assigns of the Donor.

(12) All terms and conditions with respect to this offer are expressly containd herein and the Donor agrees that no representative or agent of the United States has made any representation or promise with respect to this offer not expressly contained herein.

Signed, Sealed, and Delivered this _____ day of _____, 19_____

_____ _____

Witness Donor

Notice of acceptance of this offer is to be sent to:

_____

Name

_____

Address

_____

City State Zip

Acceptance of Offer to Donate Real Property

Date:

The offer of the Donor contained herein is hereby accepted for an on behalf of the United States of America.

_____

(Name and Title)

Witness:_____

These spaces will be used for witnesses' signatures if required by state law.

Volume 2

Appendix 2—K.S.A. 58-2223b

"Mother Hubbard" clause in conveyance valid as between parties; ineffective as to subsequent purchasers without knowledge. Luthi v. Evans, 223 K. 622, 627, 628, 576 P.2d 1064.

58-2223a. Certificates of value upon transfer of title to real estate; use of information. No deed or instrument providing for the transfer of title to real estate, shall be recorded in the office of the register of deeds unless such deed or instrument shall be accompanied by a certificate of value by the grantor, grantee or his or her agent concerning the property transferred. The register of deeds shall in conjunction with the county clerk use the information derived from said certificate in preparing the report to the director of property valuation as provided for in K.S.A. 1976 Supp. 79-1436.

History: L. 1967, ch. 310, § 1; L. 1968, ch. 336, § 2; July 1.

Law Review and Bar Journal References:

1965-69 survey of estate planning and future interests, James K. Logan, 17 K.L.R. 455, 460 (1969).

CASE ANNOTATIONS

1. Appeal from order directing inspection of records held to be moot question. Sybrant v. Williams, 206 K. 469, 470, 479 P.2d 814.

58-2223b. Certificates of value; "value" defined; disposition and use of contents of certificates. Value shall, in the case of any deed not a gift, be the amount of the full actual consideration thereof, paid or to be paid, including the amount of any lien or liens assumed. Such certificate of value shall contain a statement of the classification and subclassification to which such property belongs for the purpose of determining the fair market value of the property. Such certificate shall not be filed of record but shall be retained for a period of two (2) years at which time they shall be destroyed. The contents of said certificate shall be made available not only to the county clerk for the purpose of preparing the report to the director of property valuation but the information in such certificates shall be made available to the county assessor and appraisers employed by the county for appraisal of property located within the county, if any, and to the board of county commissioners but shall not be otherwise disclosed by any party having access to them to anyone other than the director of property valuation or to the board of tax appeals in the event of proceedings before that board.

History: L. 1967, ch. 310, § 2; L. 1969, ch. 274, § 1; July 1.

Law Review and Bar Journal References:

"1969 Kansas Legislature—A Review of Enactment," Robert F. Bennett, 38 J.B.A.K. 89, 130 (1969).

CASE ANNOTATIONS

1. Appeal from order directing inspection of records held to be moot question. Sybrant v. Williams, 206 K. 469, 470, 479 P.2d 814.

58-2223c. Same; inapplicability to certain transfers. The certificate of value required by this act shall not apply to transfers of title:

(1) Recorded prior to the effective date of this act;

(2) to the United States of America, the state of Kansas or any of the instrumentalities, agencies, or political subdivisions thereof;

(3) made solely for the purpose of securing or releasing security for a debt or other obligation;

(4) made for the purpose of confirming, correcting, modifying or supplementing a deed previously recorded, and without additional consideration;

(5) by way of gift;

(6) on sales for delinquent taxes or assessments;

(7) to cemetery lots; or

(8) by leases and transfers of severed mineral interests.

History: L. 1967, ch. 310, § 3; July 1.

58-2223d. Same; form. The certificate of value shall include a statement certifying the address to which tax statements for the property are to be sent. Said certificate shall be in the following form:

CERTIFICATE OF VALUE

I hereby certify that the total consideration paid for the property transferred by the deed or instrument of which this certificate is appended covering is, to the best of my knowledge or belief as follows:

$_____

I further certify that the present use of the property is _____

_____

and its intended use is _____

and that as a result such property is properly classified for the purpose of determining the fair market value thereof as _____

_____.

I further certify that the address to which tax statements for the property are to be sent is

_____
(Mailing address for tax statements)

Given this _____ day of _____, 19____

Signature _____
(Grantor, grantee or his or her agent)

_____
(Address)

History: L. 1967, ch. 310, § 4; L. 1968, ch. 336, § 1; L. 1969, ch. 274, § 2; L. 1975, ch. 292, § 1; July 1.

58-2223e. Same; penalty for violations. Any person who shall falsify the value of real estate transferred shall be deemed guilty of a misdemeanor and upon conviction thereof shall be fined not more than one hundred dollars ($100).

History: L. 1967, ch. 310, § 5; July 1.

58-2224. Recordation of instruments, papers or documents; making of photographic or microphotographed copies deemed recording and record books, when. Wherever the statutes require court records, deeds, patents, plats, charters of corporations, certificates of decrease of capital stock or other instruments, papers, or documents, to be recorded by any city, county or state officer, the making of photographic copies of such instruments, papers or documents, or the making of microphotographed copies shall be deemed recording. Photographic copies may be bound, paged and indexed wherever it is so provided for instruments, papers, or documents, recorded by hand, and such photographic copies when bound together shall be deemed record books. Microphotographed copies shall be placed in conveniently accessible files with provisions made for their preservation, examination and ready use by those persons lawfully entitled to view them and when such conditions are met they shall be deemed record books. This act shall be supplemental to existing statutes.

History: L. 1915, ch. 286, § 1; R.S. 1923, 67-224; L. 1970, ch. 218, § 1; July 1.

Cross References to Related Sections:

Reproduction of records of municipalities on film, see 12-122, 12-124.

Filing and recordation of corporate instruments, see 17-6003.

Recordation and preservation of county records, see 19-250 et seq.

Authentication of copies of records for evidentiary purposes, see 60-465.

Photographic copies to prove content of business and public records, see 60-469.

Reproduction of school records on film, see 72-5371 to 72-5373.

Reproduction of state records, papers or documents on film, see 75-3506.

Documentary originals as best evidence, see 60-467.

CASE ANNOTATIONS

1. Presumption that recorded instrument speaks truth; presumption rebuttable. Jackman v. Development Co., 106 K. 59, 64, 187 P. 258.

2. Admissibility of exhibit in evidence questioned; conviction of driving automobile while license suspended (dissenting opinion). State v. Harkness, 189 K. 581, 585, 370 P.2d 100.

58-2225.

History: G.S. 1868, ch. 22, § 22; R.S. 1923, 67-225; Repealed, L. 1943, ch. 232, § 4; March 22.

Revisor's Note:

New act, see 58-601.

CASE ANNOTATIONS

1. Power of attorney to convey is not power to mortgage. Gaylord v. Stebbins, 4 K. 42.

2. The scope covered by general power of attorney considered. Marshall v. Shibley, 11 K. 114.

3. Power to draw money when abused may be revoked. Irwin v. Thomas, 12 K. 93.

4. Power to mortgage if agent cannot sell, valid power; construed. Mylius v. Copes, 23 K. 617.

5. Power to release mortgage must be shown in record. O'Neill v. Douthitt, 40 K. 689, 20 P. 493.

58-2226.

History: G.S. 1868, ch. 22, § 23; R.S. 1923, 67-226; Repealed, L. 1943, ch. 232, § 4; March 22.

CASE ANNOTATIONS

1. Effect of not recording power of attorney; power not avoided. Huselton v. Liggett, 110 K. 145, 152, 202 P. 972.

58-2227.

History: G.S. 1868, ch. 22, § 24; R.S. 1923, 67-227; Repealed, L. 1943, ch. 232, § 4; March 22.

Revisor's Note:

New act, see 58-602.

58-2228. Validity of instruments acknowledged in other states. All deeds, mortgages, powers of attorney and other instruments of writing for the conveyance or encumbrance of any lands, tenements or hereditaments situate within this state, executed and acknowledged or proved in any other state, territory, or country, in conformity with the laws of such state, territory, or country, or in conformity with the laws of this state, shall be as valid as if executed within this state in conformity with the provisions of this act.

Volume 2

Appendix 3—1987 Session Laws of Kansas, Chapter 327

CHAPTER 327 *

Senate Bill No. 430

AN ACT concerning the superconducting super collider; authorizing the acquisition of real property and interest or rights therein for certain purposes relating thereto; granting power of eminent domain under certain circumstances; granting certain rights to and imposing certain duties upon the secretary of commerce; authorizing entry upon land in certain circumstances; establishing the super collider project fund; authorizing the state corporation commission to determine the telecommunications provider and electric supplier for the superconducting super collider.

Be it enacted by the Legislature of the State of Kansas:

Section 1. (a) The department of commerce, acting through the secretary of commerce, in the name of the state, may acquire fee simple title or easement by gift, purchase, dedication or by the exercise of the right of eminent domain: (1) To, upon or under any lands or interests or rights therein; (2) to water, gravel, stone, sand or other material; (3) to spoil banks, borrow pits or disposal sites; (4) to access ways, to spoil banks or borrow pits or any bed, pit, quarry or other place where gravel, stone, water or other material or substance is located; (5) to access roads or utility easements necessary to serve lands or rights in land so acquired; and (6) to control access to the lands or rights in land so acquired, all in furtherance of the state acquisition of land for the superconducting super collider. The secretary of commerce, in the name of the state, may acquire title to an entire lot, block or tract of land for the superconducting super collider even though such entire lot, block or tract is not immediately needed for such purpose, if the secretary finds that by so doing the interests of the public will be best served, and without limiting the foregoing, the same may be done where uneconomic remnants of land would be left the original owner or where severance or consequential damage to a remainder make the acquisition of the entire lot, block or tract more economical to the state or where requested to do so by the owner of the lot, block or tract of land.

(b) (1) Exercise of the right of eminent domain by the secretary shall be in accordance with and governed by article 5 of chapter 26 of the Kansas Statutes Annotated.

(2) Every petition filed by the secretary to acquire lands or any interest in or title thereto by the exercise of the right of eminent domain shall set forth the extent, quantity and nature of the interest or title to be acquired.

(3) Except as otherwise provided in paragraph (b)(4), the secretary may subordinate but shall not acquire by eminent domain any right, title or interest in or to the oil and gas or other

minerals under or in any lands, and the petition in any condemnation proceedings shall state that right, title or interest in or to such oil and gas or other minerals is not being condemned but that the same may be subordinated to projects in furtherance of the superconducting super collider.

(4) The secretary may acquire by eminent domain the fee simple title to lands when such lands are acquired for sites for improvements necessary or incident to the superconducting super collider.

(c) The secretary may acquire fee simple title or any lesser degree of title, interest or rights in land by purchase, gift, dedication or exercise in the name of the state by the right of eminent domain in furtherance of the state acquisition of land for the superconducting super collider.

(d) The secretary may donate, sell or trade the real estate or any right, title or degree or variety of interest therein which has been acquired in accordance with the provisions of this section to the federal government or any agency thereof or any other person or entity.

(e) The secretary may enter into such contracts and agreements and perform such other duties as may be necessary to carry out the provisions of this section.

(f) The secretary may enter or authorize designees to enter upon any property to make surveys, examinations, investigations and tests and to acquire other necessary and relevant data in contemplation of the acquisition of land or rights in land pursuant to this section. Prior to entering upon any such property the secretary or designee shall first request permission of the landowner. Where consent to do the things authorized in this subsection (f) is not given to the secretary or designee by the owner or occupant of the land involved, the secretary or designee may proceed as authorized after giving 10 days' written notice to landowner or occupant of the secretary's or designee's intention to conduct such surveys, examinations, investigations and tests. Entry upon any property, pursuant to this subsection (f) shall not be considered to be a trespass and no damages shall be recoverable solely because of such entry.

(g) This section shall be part of and supplemental to the provisions of article 50 of chapter 74 of the Kansas Statutes Annotated and acts amendatory of the provisions thereof or supplemental thereto.

Sec. 2. (a) There is hereby established in the state treasury the super collider project fund which shall be administered by the secretary of commerce. All expenditures from such fund shall

be made upon warrants of the director of accounts and reports pursuant to vouchers approved by the secretary of commerce or the secretary's designee.

(b) Moneys in the super collider project fund shall be used only for the purposes of paying expenses relating to securing the location of the federal superconducting super collider project site in this state.

(c) Upon certification by (1) the federal department of energy to the governor that the state of Kansas has been selected as the official site of the superconducting super collider project and (2) the secretary of commerce to the director of accounts and reports that the unencumbered balance in the super collider project fund is insufficient to pay projected expenditures therefrom, the director of accounts and reports shall transfer an amount equal to the insufficiency from the state general fund to the super collider project fund, with the approval of the state finance council. Transfers pursuant to this subsection are hereby characterized as a matter of legislative delegation and subject to the guidelines prescribed in subsection (c) of K.S.A. 75-3711c and amendments thereto, except that such approval also may be given when the legislature is in session.

Sec. 3. (a) As used in this section: (1) "Telecommunications public utility" means any public utility, as defined in K.S.A. 66-104 and amendments thereto which owns, controls, operates or manages any equipment, plant or generating machinery, or any part thereof, for the transmission of telephone messages, as defined in K.S.A. 66-104 and amendments thereto in or through any part of Kansas.

(2) "Commission" means the state corporation commission.

(3) "Superconducting super collider project" means the United States department of energy particle accelerator facility.

(b) (1) This section recognizes the importance of the superconducting super collider project to Kansas' future economic development and thereby endeavors to enhance Kansas' opportunity of being awarded such a project.

(2) Subject to the provisions of this section, the commission shall have the authority upon application by a telecommunications public utility, to determine the telecommunications public utility to be responsible for providing all telecommunications service to the superconducting super collider project.

(c) (1) In determining which telecommunications public utility shall provide service to the superconducting super collider project, the commission shall select a telecommunications public utility which provides service in the territory where the

switch for the superconducting super collider project shall be located.

(2) The commission shall also ascertain that the telecommunications public utility selected is able to meet the specifications of the superconducting super collider project.

Sec. 4. (a) As used in this section: (1) "Electric transmission lines" means any line or extension of a line which is at least five miles in length and which is used for the bulk transfer of 230 kilowatts or more of electricity.

(2) "Retail electric supplier" means any person, firm, corporation, municipality, association or cooperative corporation engaged in the furnishing of retail electric service.

(3) "Certified territory" means an electric service territory certified to a retail electric supplier pursuant to K.S.A. 66-1,170 *et seq.* and amendments thereto.

(4) "Superconducting super collider project" means the United States department of energy particle accelerator facility.

(b) (1) This section recognizes the importance of the superconducting super collider project to Kansas' future economic development and thereby endeavors to enhance Kansas' opportunity of being awarded such project.

(2) Subject to the provisions of this section, the state corporation commission shall have the authority upon application by any retail electric supplier or group of suppliers, to determine the electric supplier or suppliers to be responsible for providing service to the superconducting super collider, including the termination of service rights and awarding of such service rights to another retail electric supplier.

(c) (1) Fair and reasonable compensation shall be paid to the terminated retail electric supplier by the supplier subsequently authorized to provide electric service. Such amount shall be an amount mutually agreed upon by the affected parties or the sum of the following:

(A) The depreciated replacement cost for the electric utility facilities in the territory in which the service rights have been terminated. As used in this paragraph, "depreciated replacement cost" means the original installed cost of the facilities, adjusted to present value by utilizing a nationally recognized index of utility construction costs, less accumulated depreciation based on the book depreciation rates of the selling utility as filed with and approved by the state corporation commission, which are in effect at the time of acquisition;

(B) all reasonable and prudent costs of detaching the electric system facilities to be sold and all reasonable and prudent costs

of reintegrating the remaining electric system facilities of the retail electric supplier whose service rights are terminated;

(C) an amount equal to 100% of the gross revenues attributable to the existing customers in the terminated territory during the 12 months next preceding the date of termination of the service rights; and

(D) an amount equal to the state and federal tax liability created by the taxable income pursuant to the provisions of this paragraph and paragraphs (A), (B) and (C) by the retail electric supplier whose service rights are terminated, calculated without regard to any tax deductions or benefits not related to the sale of assets covered herein.

(2) In the event that the parties are unable to agree upon an amount of compensation to be paid pursuant to subsection (c)(1), after 60 days following the date of termination of service rights either party may apply to the state corporation commission for determination of compensation. Such determination shall be made by the corporation commission within 60 days of such application.

(d) This section shall supersede those relevant portions of K.S.A. 66-1,170 *et seq.* and K.S.A. 66-1,177*et seq.*, and amendments thereto.

Sec. 5. This act shall take effect and be in force from and after its publication in the Kansas register.

Approved May 11, 1987.

Published in the *Kansas Register* May 14, 1987.

Volume2

Appendix 4—Kansas Laws Concerning Eminent Domain

celed and stricken from the tax rolls, and the county clerk and the county treasurer of such county shall correct their records to conform thereto and the county clerk shall notify the taxing authorities of any district in which such real estate, or any part thereof, is situated of such corrections.

History: L. 1955, ch. 434, § 1; June 30.

Revisor's Note:
"Preamble to this act," see L. 1955, ch. 434.

Article 3.—CONDEMNATION OF LAND POSSESSING HISTORICAL INTEREST

Revisor's Note:
New eminent domain procedure act, see 26-501 et seq.

Cross References to Related Sections:
Condemnation of lands under jurisdiction and control of state historical society, see 75-2714.

26-301.
History: L. 1921, ch. 271, § 1; R. S. 1923, 26-301; Repealed, L. 1974, ch. 364, § 40; Jan. 13, 1975.

CASE ANNOTATIONS

1. Land of historical interest taken by state is for public use. State, *ex rel.*, v. Kemp, 124 K. 716, 261 P. 556. Affirmed: 278 U.S. 192, 49 S.Ct. 160, 73 L.Ed. 259.

2. Cited in discussing various eminent domain statutes (dissenting opinion). Moore v. Kansas Turnpike Authority, 181 K. 841, 850, 317 P.2d 384.

26-302.
History: L. 1921, ch. 271, § 2; R. S. 1923, 26-302; Repealed, L. 1974, ch. 364, § 40; Jan. 13, 1975.

CASE ANNOTATIONS

1. Legislature declared land of historical interest; taken for public use. State, *ex rel.*, v. Kemp, 124 K. 716, 261 P. 556. Affirmed: 278 U.S. 192, 49 S.Ct. 160, 73 L.Ed. 259.

26-303, 26-304.
History: L. 1921, ch. 271, §§ 3, 4; R.S. 1923, 26-303, 26-304; Repealed, L. 1963, ch. 234, § 103; Jan. 1, 1964.

26-305, 26-306.
History: L. 1921, ch. 271, §§ 5, 6; R. S. 1923, 26-305, 26-306; Repealed, L. 1974, ch. 364, § 40; Jan. 13, 1975.

Article 4.—STONE QUARRIES

26-401. Procedure for taking stones. Whenever in the prosecution of any public works by the state, or in the erection of public buildings under the authority of the state, it shall be necessary to take any stone or stones from any stone quarry for the purpose of erecting such building, the same may be taken and appropriated in the same manner as is provided by K.S.A. 26-501 to 26-516, inclusive.

History: L. 1865, ch. 80, § 1; G.S. 1868, ch. 106, § 1; R.S. 1923, 26-401; L. 1963, ch. 234, § 75; Jan. 1, 1964.

Research and Practice Aids:
Eminent Domain⇐45.
C.J.S. Eminent Domain § 65 et seq.

26-402. Damages paid by contractor. The contractor or contractors for such works shall in all cases pay the damages which shall be assessed.

History: L. 1865, ch. 80, § 2; Feb. 22; G.S. 1868, ch. 106, § 2; R.S. 1923, 26-402.

Article 5.—PROCEDURE ACT

Cross References to Related Sections:
Constitutional provisions relating to right to exercise eminent domain by certain corporations, see Kan. Const., article 12, § 4.
Condemnation of lands under jurisdiction and control of state historical society, see 75-2714.

Law Review and Bar Journal References:
1963 act explored and analyzed, Marion Beatty, 32 J.B.A.K. 125 (1963).
"Comments on Practice and Procedure in Eminent Domain," Raymond L. Spring, 35 J.B.A.K. 7 (1966).
"Railroad Right of Way: The Real Property Interest in Kansas," Tim Pittman, 25 W.L.J. 327, 336 (1986).

26-501. Eminent domain procedure; venue. (a) The procedure for exercising eminent domain as set forth in K.S.A. 26-501 to 26-516, inclusive, shall be followed in all proceedings. (b) The proceedings shall be brought by filing a verified petition in the district court of the county in which the real estate is situated, except if it be an entire tract situated in two (2) or more counties, the proceedings may be brought in any county in which any tract or parts thereof is situated.

History: L. 1963, ch. 234, § 1; Jan. 1, 1964.

Cross References to Related Sections:
Venue provisions of code of civil procedure, see ¶ (*a*) of 60-601.

Research and Practice Aids:
Eminent Domain⇐173, 191(1).
C.J.S. Eminent Domain §§ 233, 251 et seq.

Law Review and Bar Journal References:
Survey of the law of damages, David Prager, 12 K.L.R. 204 (1963).

CASE ANNOTATIONS

1. Proceedings not judicial in nature until appeal is

filed; injunction landowner's relief. Urban Renewal Agency v. Decker, 197 K. 157, 415 P.2d 373.

2. Public utility, in absence of bad faith, fraud or abuse of discretion, may determine amount of land needed to be taken for its lawful purposes. Shelor v. Western Power & Gas Co., 202 K. 428, 449 P.2d 591.

3. Failure of city to comply with statutory duties (13-1019, 13-1020) does not preclude aggrieved property owner from bringing inverse condemnation action on implied contract. Lux v. City of Topeka, 204 K. 179, 181, 183, 460 P.2d 541.

4. Eminent domain procedure prescribed under this and succeeding section; 68-413 merely designates interests which highway commission may acquire. State Highway Commission v. Moore, 204 K. 502, 504, 464 P.2d 188.

5. Tract of land having leasehold interest dismissed from condemnation proceeding; lessee's rights. State Highway Commission v. Bullard, 208 K. 558, 559, 560, 493 P.2d 196.

6. Eminent domain statute contains no specific provision for allowance of attorney fees and expenses of litigation, other than court costs. Gault v. Board of County Commissioners, 208 K. 578, 493 P.2d 238.

7. Statute contains no authority for allowance of attorney's fee. Schwartz v. Western Power & Gas Co., Inc., 208 K. 844, 847, 849, 494 P.2d 1113.

8. Constitutionality of eminent domain procedure cannot be raised where question moot. Thompson v. Kansas City Power & Light Co., 208 K. 869, 870, 494 P.2d 1092.

9. This and succeeding sections cited in construing section (12-811) concerning purchase of corporate utility plant on expiration of franchise. City of Kiowa v. Central Telephone & Utilities Corporation, 213 K. 169, 172, 515 P.2d 795.

10. Action instituted hereunder; provision for attorney fees under 26-509 remedial; applied to actions pending. Fellers v. State Highway Commission, 214 K. 630, 631, 522 P.2d 341.

11. Act applied; injunction proceeding against electric utility; no abuse of discretion; trial court's findings reviewed and affirmed. Concerned Citizens, United, Inc. v. Kansas Power and Light Co., 215 K. 218, 226, 523 P.2d 755.

12. Proceeding in nature of inverse condemnation; landownership jury question; verdict upheld. Wittke v. Kusel, 215 K. 403, 524 P.2d 774.

13. Proceedings hereunder not forum for litigation of right of exercise of eminent domain or extent thereof. Kansas Gas & Electric Co. v. Winn, 227 K. 101, 103, 106, 605 P.2d 125.

14. Trial court did not abuse discretion in excluding evidence of specific value of leasehold interest but allowing evidence thereof as factor in arriving at value. City of Manhattan v. Kent, 228 K. 513, 618 P.2d 1180.

15. District court without jurisdiction to enlarge appeal period of 26-508. City of Kansas City v. Crestmoore Downs, Inc., 7 K.A.2d 515, 518, 644 P.2d 494 (1982).

16. Condemnor allowed reasonable discretion to determine necessity for taking of land for lawful corporate purposes. Steele v. Missouri Pacific R.R. Co., 232 K. 855, 856, 862, 659 P.2d 217 (1983).

17. Proceedings hereunder not forum for litigation over right to exercise eminent domain or extent thereof. *In re* Condemnation of Land for State Highway Purposes, 235 K. 676, 678, 680, 683 P.2d 247 (1984).

18. Condemnation proceeding does not provide forum for litigating right to exercise eminent domain or extent thereof. Murray v. Kansas Dept. of Transportation, 239 K. 25, 716 P.2d 540 (1986).

26-502. Contents of petition. A petition shall include allegations of (1) the authority for and the purpose of the taking; (2) a description of each lot, parcel or tract of land and the nature of the interest to be taken; (3) insofar as their interests are to be taken (a) the name of any owner and all lienholders of record, and (b) the name of any party in possession. Such petition shall be verified by affidavit. Upon the filing of such petition the court by order shall fix the time when the same will be taken up. No defect in form which does not impair substantial rights of the parties shall invalidate any proceeding.

History: L. 1963, ch. 234, § 2; Jan. 1, 1964.

Research and Practice Aids:
Eminent Domain⇐191(1) et seq.
C.J.S. Eminent Domain § 251 et seq.

CASE ANNOTATIONS

1. Compensation is based on full use condemned as described in condemner's petition and considered by appraisers. Diefenbach v. State Highway Commission, 195 K. 445, 407 P.2d 228.

2. Duty to ascertain parties; owners, lienholders of record and those in possession. Dotson v. State Highway Commission, 198 K. 671, 674, 675, 426 P.2d 138.

3. The only obligation as to parties insofar as the condemner is concerned is to name in the petition the owners and all lienholders of record and the name of any party in possession. Morgan v. City of Overland Park, 207 K. 188, 193, 483 P.2d 1079.

4. Act applied; injunction proceeding against electric utility; no abuse of discretion; trial court's findings reviewed and affirmed. Concerned Citizens, United, Inc. v. Kansas Power and Light Co., 215 K. 218, 226, 523 P.2d 755.

26-503. Eminent domain procedure; notice. The plaintiff shall cause to be published once in a newspaper of general circulation in the county where the lands are situated a notice of the proceeding at least nine (9) days in advance of the date fixed by the court for consideration of the petition and appointment of appraisers, and shall at least seven (7) days before such date mail to each interested party as named in K.S.A. 26-502 and whose address is known or can with reasonable diligence be ascertained a copy of such publication notice and petition

insofar as it relates to his interest. No defect in any notice or in the service thereof shall invalidate any proceedings.

History: L. 1963, ch. 234, § 3; L. 1969, ch. 195, § 1; July 1.

Research and Practice Aids:
Eminent Domain⇐180, 181.
C.J.S. Eminent Domain §§ 242, 243, 244.

Law Review and Bar Journal References:
Court delay, George S. Reynolds, 12 W.L.J. 16 (1972).
Survey of Kansas law on real and personal property (1965-1969), 18 K.L.R. 427, 436 (1970).

CASE ANNOTATIONS

1. Duty of condemner to ascertain parties. Dotson v. State Highway Commission, 198 K. 671, 674, 426 P.2d 138.
2. Section complied with; condemnees bound by the notice. Unified School District v. Turk, 219 K. 655, 659, 660, 549 P.2d 882.
3. Where appraisers' report filed after date fixed by court, parties have 30 days thereafter to appeal. City of Shawnee v. Webb, 236 K. 504, 505, 507, 694 P.2d 896. (1985).

26-504. Same; findings; order appointing appraisers; duties; appeals to supreme court, when. If the judge finds from the petition: (1) the plaintiff has the power of eminent domain; and (2) the taking is necessary to the lawful corporate purposes of the plaintiff, he shall enter an order appointing three (3) disinterested householders of the county in which the petition is filed to view and appraise the value of the lots and parcels of land found to be necessary, and to determine the damages to the interested parties resulting from the taking. Such order shall also fix the time for the filing of the appraisers' report, and such time for filing shall not be later than twenty (20) days after the entry of such order: *Provided,* For good cause shown, the court may extend the time for filing by a subsequent order. The granting of an order determining that the plaintiff has the power of eminent domain and that the taking is necessary to the lawful corporate purposes of the plaintiff shall not be considered a final order for the purpose of appeal to the supreme court, but an order denying the petition shall be considered such a final order.

Appeals to the supreme court may be taken from any final order under the provisions of this act. Such appeals shall be prosecuted in like manner as other appeals and shall take precedence over other cases, except cases of a like character and other cases in which preference is granted by statute.

History: L. 1963, ch. 234, § 4; Jan. 1, 1964.

Research and Practice Aids:
Eminent Domain⇐228, 234(5), 238(2).
C.J.S. Eminent Domain §§ 293, 303, 350.

CASE ANNOTATIONS

1. Determination of necessity and authority inquest only; injunction landowner's relief. Urban Renewal Agency v. Decker, 197 K. 157, 158, 415 P.2d 373.
2. Applied; dismissal of tract of land in proceeding did not impliedly authorize application of code of civil procedure. State Highway Commission v. Bullard, 208 K. 558, 560, 493 P.2d 196.
3. Allowance of attorney's fee requires clear statutory authority. Schwartz v. Western Power & Gas Co., Inc., 208 K. 844, 849, 850, 494 P.2d 1113.
4. Date fixed by judge for filing appraiser's report is date from which appeal time computed, regardless of when report is delivered. Urban Renewal Agency v. Reed, 211 K. 705, 706, 708, 508 P.2d 1227.
5. Act applied; injunction proceeding against electric utility; no abuse of discretion; trial court's findings reviewed and affirmed. Concerned Citizens, United, Inc. v. Kansas Power and Light Co., 215 K. 218, 226, 523 P.2d 755.
6. Court had no power to correct, modify or amend award following appeal or time for appeal. Unified School District v. Turk, 219 K. 655, 657, 658, 549 P.2d 882.
7. Determination that taking of land is necessary to lawful corporate purposes made by district court from allegations of petition. Steele v. Missouri Pacific R.R. Co., 232 K. 855, 857, 858, 863, 659 P.2d 217 (1983).
8. Condemner's rights acquired and compensation to landowner considered. Barcus v. City of Kansas City, 8 K.A.2d 506, 507, 661 P.2d 806 (1983).
9. Cited in holding 60-2102 does not provide for appeals in original eminent domain proceedings. *In re* Condemnation of Land for State Highway Purposes, 235 K. 676, 682, 683 P.2d 247 (1984).
10. Appeal of eminent domain proceedings under 60-2102(b); original proceeding in eminent domain not truly classed as litigation. Razook v. Kemp, 236 K. 156, 159, 690 P.2d 376 (1984).
11. Where appraisers' report filed after date fixed by court, parties have 30 days thereafter to appeal. City of Shawnee v. Webb, 236 K. 504, 505, 507, 694 P.2d 896 (1985).

26-505. Same; appraisers' oath, instructions, reports and notification to condemner; notice to interested persons by condemner; fees and expenses. After the appraisers are appointed they shall take an oath to faithfully discharge their duties as appraisers. The judge shall instruct them to the effect that they are officers of the court and not representatives of the plaintiff or any other party, that they are to receive their instructions only from the judge, and he shall instruct them as to the nature of their duties and authority, and as to the basis, manner and measure of ascertaining the value of the land taken and damages result-

ing therefrom. The instructions shall be in writing. Upon the completion of their work the appraisers shall file their report in the office of the clerk of the district court and the appraisers shall thereupon notify the condemner of such filing. The condemner shall, within three (3) days after receiving such notice, mail a written notice of the filing of such report to every person who owns any interest in any of the property being taken, if the address of such person is known, and shall file in the office of the clerk of the district court an affidavit showing proof of the mailing of such notice. The fees and expenses of the appraisers shall be determined and allowed by the court.

History: L. 1963, ch. 234, § 5; L. 1968, ch. 138, § 1; July 1.

Research and Practice Aids:
Eminent Domain⇐229, 233, 234(5).
C.J.S. Eminent Domain §§ 277, 295, 303.

CASE ANNOTATIONS

1. Applied; dismissal of tract of land in proceeding did not impliedly authorize application of code of civil procedure. State Highway Commission v. Bullard, 208 K. 558, 560, 493 P.2d 196.

2. Allowance of attorney's fee requires clear statutory authority. Schwartz v. Western Power & Gas Co., Inc., 208 K. 844, 850, 494 P.2d 1113.

3. Date fixed by judge for filing appraiser's report is date from which appeal time computed, regardless of when report is delivered. Urban Renewal Agency v. Reed, 211 K. 705, 708, 709, 508 P.2d 1227.

4. Constructive notice provisions complied with; effect of actual notice. Unified School District v. Turk, 219 K. 655, 659, 549 P.2d 882.

26-506. Same; view of lands by appraisers. (a) *Notice, time, place and manner of hearing.* The appraisers shall, after they have been sworn, and instructed by the judge, make their appraisal and assessment of damages, by actual view of the lands to be taken and of the tracts of which they are a part, and by hearing of oral or written testimony from the plaintiff and each interested party as named in section K.S.A. 26-502. Such testimony shall be given at a public hearing held in the county where the action is pending at a time and place fixed by the appraisers. Notice of the hearing shall be mailed at least ten (10) days in advance thereof to the plaintiff and to each party named in the petition if their address is known or can with reasonable diligence be ascertained, and by one publication in a newspaper of general circulation in each county where the lands are situated at least ten (10) days in advance of the hearing. In case of failure to meet on the day designated in the notice, the appraisers may meet on the following day without further notice; but in case of failure to meet on either of said days, a new notice shall be required. A hearing begun pursuant to proper notice may be continued or adjourned from day to day and from place to place until the hearing with respect to all properties involved in the action has been concluded.

(b) *Form of notice.* The notice of hearing shall be in substantially the following form:

IN THE DISTRICT COURT OF _____ COUNTY, KANSAS.
_____ Plaintiff, vs. _____ Defendant,

Notice is hereby given that the undersigned appraisers appointed by the court, will, in accordance with the provisions of this act, hold a public hearing on all matters pertaining to their appraisal of compensation and the assessment of damages for the taking of the lands or interests therein sought to be taken by the plaintiff in the above entitled matter covering the following described lands (description of lands). Such hearing will commence at _____ o'clock ____M. on the _____ day of _____, 19____ at _____, or on the following day without further notice, and may be continued thereafter from day to day or place to place until the same is concluded with respect to all properties involved in the action. Any party may present either oral or written testimony at such hearing.

You are further notified that the court has set the _____ day of _____, 19____, for the filing of the awards of these appraisers with the clerk of the court, and any party dissatisfied with the award may appeal therefrom as by law permitted within thirty days from the day of filing.

_____ _____ _____ Appraisers.

History: L. 1963, ch. 234, § 6; Jan. 1, 1964.

Research and Practice Aids:
Eminent Domain⇐231, 232.
C.J.S. Eminent Domain §§ 279, 296, 298.

CASE ANNOTATIONS

1. Duty of condemner to ascertain parties. Dotson v. State Highway Commission, 198 K. 671, 674, 426 P.2d 138.

2. Date fixed by judge for filing appraiser's report is date from which appeal time computed, regardless of when report is delivered. Urban Renewal Agency v. Reed, 211 K. 705, 706, 708, 508 P.2d 1227.

3. Constructive notice provisions complied with; effect of actual notice. Unified School District v. Turk, 219 K. 655, 659, 549 P.2d 882.

26-507. Same; payment of award and vesting of rights; abandonment. (a) *Payment of award; vesting of rights.* If the plaintiff desires to continue with the proceeding as to particular tracts it shall, within thirty (30) days from the time the appraisers' report is

filed pay to the clerk of the district court the amount of the appraisers' award as to those particular tracts and court costs accrued to date, including appraisers' fees. Such payment shall be without prejudice to plaintiff's right to appeal from the appraisers' award. Upon such payment being made the title, easement or interest appropriated in the land condemned shall thereupon immediately vest in the plaintiff, and it shall be entitled to the immediate possession of the land to the extent necessary for the purpose for which taken and consistent with the title, easement or interest condemned. The plaintiff shall be entitled to all the remedies provided by law for the securing of such possession.

(b) *Abandonment.* If the plaintiff does not make the payment prescribed in subsection (a) hereof for any of the tracts described in the petition, within thirty (30) days, from the time the appraisers' report is filed, the condemnation is abandoned as to those tracts, and judgment for costs, including the appraisers' fees together with judgment in favor of the defendant for his reasonable expenses incurred in defense of the action, shall be entered against the plaintiff. After such payment is made by the plaintiff to the clerk of the court, as provided in subsection (a) hereof, the proceedings as to those tracts for which payment has been made can only be abandoned by the mutual consent of the plaintiff and the parties interested in the award.

History: L. 1963, ch. 234, § 7; Jan. 1, 1964.

Research and Practice Aids:
Eminent Domain⇐74, 76, 246(3).
C.J.S. Eminent Domain §§ 186 et seq., 336.

Law Review and Bar Journal References:
Survey of the law of damages, David Prager, 12 K.L.R. 204 (1963).

CASE ANNOTATIONS

1. Exercise of motion to dismiss; does not impliedly inject code of civil procedure into condemnation proceedings. State Highway Commission v. Bullard, 208 K. 558, 560, 561, 493 P.2d 196.

2. Referred to; court had no authority to modify or amend award after appeal or time for appeal. Unified School District v. Turk, 219 K. 655, 658, 549 P.2d 882.

3. Writ of assistance applied for hereunder by condemnor; condemnation proceeding not forum for litigation over right of exercise of eminent domain or extent thereof. Kansas Gas & Electric Co. v. Winn, 227 K. 101, 102, 107, 605 P.2d 125.

4. Dismissal of condemnation action by city after purchase of property by agreement with owner does not constitute abandonment permitting defendant lessee to recover reasonable expenses in defense of action. City of Westwood v. M & M Oil Co., 6 K.A.2d 48, 49, 626 P.2d 817.

5. If proceeding is dismissed by condemning authority prior to filing of appraiser's report, landowner not entitled to attorney fees and costs. *In re* Condemnation of Land by the City of Mission v. Bennett, 7 K.A.2d 621, 622, 624, 649 P.2d 406 (1982).

26-508. Appeal from award; notice to parties affected. If the plaintiff, or any defendant, is dissatisfied with the award of the appraisers, he may, within thirty (30) days after the filing of the appraisers' report, appeal from the award by filing a written notice of appeal with the clerk of the district court. In the event any parties shall perfect an appeal, copies of such notice of appeal shall be mailed to all parties affected by such appeal, within three (3) days after the date of the perfection thereof. An appeal by the plaintiff or any defendant shall bring the issue of damages to all interest [interests] in the tract before the court for trial *de novo*. The appeal shall be docketed as a civil action and tried as any other civil action: *Provided, however,* The only issue to be determined therein shall be that of just compensation to be paid for the land or right therein taken at the time of the taking and for any other damages allowable by law.

History: L. 1963, ch. 234, § 8; L. 1968, ch. 138, § 2; July 1.

Research and Practice Aids:
Eminent Domain⇐238(1).
C.J.S. Eminent Domain §§ 343, 346.

Law Review and Bar Journal References:
Survey of Kansas law on real and personal property (1965-1969), 18 K.L.R. 427, 436 (1970).
"Administrative Law: The Kansas Commission on Civil Rights—True De Novo Review Arrives," Samuel D. Ogelby, 16 W.L.J. 161, 163 (1976).
"Judicial Review of Administrative Action—Kansas Perspectives," David L. Ryan, 19 W.L.J. 423, 433 (1980).

CASE ANNOTATIONS

1. Considered in appeal from award. Diefenbach v. State Highway Commission, 195 K. 445, 450, 407 P.2d 228.

2. Appeal from award by one party raises issue of damages to all interests. Dotson v. State Highway Commission, 198 K. 671, 675, 426 P.2d 138.

3. The phrase "tried as any other civil action" applies to presentation of facts on appeal, not to formation of pleadings; eminent domain statute forms the issue and takes the place of pleadings. City of Wellington v. Miller, 200 K. 651, 652, 438 P.2d 53.

4. No dismissal without prejudice of appeal in condemnation proceeding; when one party appeals, other parties are in position of cross-appellants and appeal

cannot be discussed over objection of any person having interest in the land. City of Wellington v. Miller, 200 K. 651, 652, 653, 438 P.2d 53.

5. Docketing of an appeal as a civil action not changed by amendment. State Highway Commission v. Lee, 207 K. 284, 290, 485 P.2d 310.

6. Limitation on appeal from award does not apply to determination of disputes as to distribution between co-owners. Urban Renewal Agency v. Naegele Outdoor Advertising Co., 208 K. 210, 212, 214, 215, 216, 491 P.2d 886.

7. Motion to dismiss as to certain tract of land; procedural; motion to intervene by leaseholder not allowed. State Highway Commission v. Bullard, 208 K. 558, 560, 493 P.2d 196.

8. Date fixed by judge for filing appraiser's report is date from which appeal time computed, regardless of when report is delivered. Urban Renewal Agency v. Reed, 211 K. 705, 706, 508 P.2d 1227.

9. Appeal hereunder; 26-509 construed; attorney fees allowed where action commenced on date section became effective. Fellers v. State Highway Commission, 214 K. 630, 631, 522 P.2d 341.

10. Court had no power to correct, modify or amend award following appeal or time for appeal. Unified School District v. Turk, 219 K. 655, 657, 549 P.2d 882.

11. Compensable damages for taking access to motel; parol evidence upheld. Kohn Enterprises, Inc. v. City of Overland Park, 221 K. 230, 233, 559 P.2d 771.

12. Method of establishing value of property upheld; no abuse of discretion in admission of testimony or evidence. Ellis v. City of Kansas City, 225 K. 168, 175, 589 P.2d 552.

13. Trial court did not abuse discretion in excluding evidence of specific value of leasehold interest but allowing evidence thereof as factor in arriving at value. City of Manhattan v. Kent, 228 K. 513, 516, 517, 519, 520, 618 P.2d 1180.

14. District court without jurisdiction to enlarge appeal period of this section. City of Kansas City v. Crestmoore Downs, Inc., 7 K.A.2d 515, 516, 517, 518, 644 P.2d 494 (1982).

15. Evidence of biological hazard of high-voltage utility line did not relate to determination of compensation. Meinhardt v. Kansas Power & Light Co., 8 K.A.2d 471, 472, 661 P.2d 820 (1983).

16. Proposed expert testimony concerning harmful biological effects of electricity from overhead power lines excluded. Meinhardt v. Kansas Power & Light Co., 8 K.A.2d 471, 472, 661 P.2d 820 (1983).

17. Court rulings prior to appeal providing trial de novo not res judicata to reconsideration of issues at de novo trial. U.S.D. No. 464 v. Porter, 234 K. 690, 692, 693, 676 P.2d 84 (1984).

18. Where appraisers' report filed after date fixed by court, parties have 30 days thereafter to appeal. City of Shawnee v. Webb, 236 K. 504, 505, 507, 694 P.2d 896 (1985).

26-509. Same; assignment for trial on appeal; attorney fees, when. In an action on appeal the court shall assign the case for trial to a jury, or to a master in accordance with K.S.A. 60-253, or acts amendatory thereof or supplemental thereto. Whenever the plaintiff condemner shall appeal the award of court appointed appraisers, and the jury renders a verdict for the landowners in an amount greater than said appraisers' award, the court may allow as court costs an amount to be paid to the landowner's attorney as attorney fees.

History: L. 1963, ch. 234, § 9; L. 1969, ch. 196, § 1; L. 1972, ch. 148, § 1; July 1.

Revisor's Note:

Consideration of contingent fee contract in awarding attorney fees, see *Kansas Benchbook*, Kansas Judicial Council, p. 130.

Research and Practice Aids:

Eminent Domain⇐238(6), 239.
C.J.S. Eminent Domain §§ 281, 360 et seq., 372.

Law Review and Bar Journal References:

"Recovery of Attorney Fees in Kansas," Mark A. Furney, 18 W.L.J. 535, 549, 558 (1979).

CASE ANNOTATIONS

1. Right to court costs did not accrue until jury rendered verdict; provisions remedial; factors considered. City of Wichita v. Chapman, 214 K. 575, 576, 579, 583, 585, 587, 588, 521 P.2d 589.

2. Provisions of section providing for attorney fees remedial; application to actions pending when section became effective. Fellers v. State Highway Commission, 214 K. 630, 631, 632, 522 P.2d 341.

3. Mentioned; trial court erred in awarding attorney fees to landowners who were appealing parties. *In re* Central Kansas Electric Coop., Inc., 224 K. 308, 319, 582 P.2d 228.

4. Statute applicable only to condemnation appeals from appraisers' awards under 26-501 et seq.; legislature has not provided for attorney fees in inverse condemnation cases. Herman v. City of Wichita, 228 K. 63, 71, 72, 612 P.2d 588.

26-510. Same; withdrawal of payment. The defendants may by order of the judge and without prejudice to their right of appeal withdraw the amount paid to the clerk of the court as their interests are determined by the appraisers' report.

History: L. 1963, ch. 234, § 10; Jan. 1, 1964.

Research and Practice Aids:

Eminent Domain⇐238(7).
C.J.S. Eminent Domain § 366 et seq.

26-511. Interest on final judgment. (a) If the compensation finally awarded on appeal exceeds the amount of money paid to the clerk of the court pursuant to K.S.A. 26-507, the judge shall enter judgment against the plaintiff for the amount of the deficiency, with interest. If the compensation finally awarded on appeal is less than the amount paid to the clerk of the court pursuant to K.S.A. 26-507, the judge shall enter judgment in favor of the plaintiff for the return of the difference, with interest.

(b) If the money paid to the clerk of the court under K.S.A. 26-507 is paid before July 1, 1982, the judgment shall bear interest as follows:

(1) On and after the date of the payment to the clerk and before July 1, 1982, at the rate of 6% per annum; and

(2) on and after July 1, 1982, and until the date the judgment is paid, at the rate provided by K.S.A. 16-204 and amendments thereto.

(c) If the money paid to the clerk of the court under K.S.A. 26-507 is paid on or after July 1, 1982, the judgment shall bear interest, on and after the date of the payment to the clerk and until the date the judgment is paid, at the rate provided by K.S.A. 16-204 and amendments thereto.

History: L. 1963, ch. 234, § 11; L. 1982, ch. 88, § 2; July 1.

Research and Practice Aids:
Eminent Domain⇐238(7).
C.J.S. Eminent Domain § 366 et seq.

CASE ANNOTATIONS

1. Specific reference to interest on eminent domain judgments controls over general provision. Schwartz v. Western Power & Gas Co., Inc., 208 K. 844, 851, 494 P.2d 1113.

2. Special statute applicable only to condemnation appeals taken under eminent domain procedure act, 26-501 et seq. Herman v. City of Wichita, 228 K. 63, 68, 69, 612 P.2d 588.

3. Determination of rate of post-judgment interest. Meinhardt v. Kansas Power & Light Co., 8 K.A.2d 471, 473, 661 P.2d 820 (1983).

26-512. Same; making surveys and location. The prospective condemner or its agents may enter upon the land and make examinations, surveys and maps thereof, and such entry shall constitute no cause of action in favor of the owners of the land, except for actual damages thereto.

History: L. 1963, ch. 234, § 12; Jan. 1, 1964.

Research and Practice Aids:
Eminent Domain⇐77.
C.J.S. Eminent Domain § 192.

26-513. Same; compensation. (a) *Necessity.* Private property shall not be taken or damaged for public use without just compensation.

(b) *Taking entire tract.* If the entire tract of land or interest therein is taken, the measure of compensation is the value of the property or interest at the time of the taking.

(c) *Partial taking.* If only a part of a tract of land or interest is taken, the compensation and measure of damages are the difference between the value of the entire property or interest immediately before the taking, and the value of that portion of the tract or interest remaining immediately after the taking.

(d) *Factors to be considered.* In ascertaining the amount of compensation and damages as above defined, the following factors, without restriction because of enumeration, shall be given consideration if shown to exist but they are not to be considered as separate items of damages, but are to be considered only as they affect the total compensation and damage under the provisions of subsections (b) and (c) of this section:

1. The most advantageous use to which the property is reasonably adaptable.

2. Access to the property remaining.

3. Appearance of the property remaining, if appearance is an element of value in connection with any use for which the property is reasonably adaptable.

4. Productivity, convenience, use to be made of the property taken, or use of the property remaining.

5. View, ventilation and light, to the extent that they are beneficial attributes to the use of which the remaining property is devoted or to which it is reasonably adaptable.

6. Severance or division of a tract, whether the severance is initial or is in aggravation of a previous severance; changes of grade and loss or impairment of access by means of underpass or overpass incidental to changing the character or design of an existing improvement being considered as in aggravation of a previous severance, if in connection with the taking of additional land and needed to make the change in the improvement.

7. Loss of trees and shrubbery to the extent that they affect the value of the land taken, and to the extent that their loss impairs the value of the land remaining.

8. Cost of new fences or loss of fences and the cost of replacing them with fences of like quality, to the extent that such loss affects the value of the property remaining.

9. Destruction of a legal nonconforming use.

10. Damage to property abutting on a right-of-way due to change of grade where accompanied by a taking of land.

11. Proximity of new improvement to

improvements remaining on condemnee's land.

12. Loss of or damage to growing crops.

13. That the property could be or had been adapted to a use which was profitably carried on.

14. Cost of new drains or loss of drains and the cost of replacing them with drains of like quality, to the extent that such loss affects the value of the property remaining.

15. Cost of new private roads or passageways or loss of private roads or passageways and the cost of replacing them with private roads or passageways of like quality, to the extent that such loss affects the value of the property remaining.

History: L. 1963, ch. 234, § 13; L. 1969, ch. 196, § 2; July 1.

Research and Practice Aids:

Eminent Domain⇐69, 126(1).

C.J.S. Eminent Domain §§ 96, 136 et seq.

Law Review and Bar Journal References:

"The Eminent Domain Procedure Act," Marion Beatty, 32 J.B.A.K. 130 (1964).

"1969 Kansas Legislature—A Review of Enactment," Robert F. Bennett, 38 J.B.A.K. 89, 127 (1969).

Survey of Kansas law on real and personal property (1965-1969), 18 K.L.R. 427, 436 (1970).

Elimination of nonconforming uses; mobile homes in Kansas, Gerald E. Hertach, 20 K.L.R. 87, 107 (1971).

"Lateral Support—An Inversely Condemnable Property Right," George A. Gaitas, 13 W.L.J. 248, 249, 251 (1974).

CASE ANNOTATIONS

1. Doctrine of burden of proof not applicable to condemnation proceedings. City of Wichita v. Jennings, 199 K. 621, 626, 433 P.2d 351.

2. Subsection (*c*) considered; verdict of jury was "within the range" of the evidence. Kansas State Highway Commission v. Roepke, 200 K. 660, 663, 665, 666, 438 P.2d 122.

3. Compensation is necessary replacement in taking of property of one governmental agency by another. City of Wichita v. Unified School District No. 259, 201 K. 110, 439 P.2d 162.

4. Evidence establishing value of entire property before taking was properly taken. Humphries v. State Highway Commission, 201 K. 544, 546, 549, 442 P.2d 475.

5. No error in permitting landowner's witnesses to testify as to separate items of damage resulting from partial taking. Dibble v. State Highway Commission, 204 K. 111, 112, 460 P.2d 584.

6. Cost of removal by lessee of personalty from leased premises for reasonable distance is not compensable element of damage. City of Manhattan v. Eriksen, 204 K. 150, 153, 154, 155, 460 P.2d 522.

7. Applied; 68-413 does not provide procedure for exercising right of eminent domain, but merely designates interests which highway commission may acquire through such procedure. State Highway Commission v. Moore, 204 K. 502, 504, 464 P.2d 188.

8. Cost of removal by lessee of his personalty not an element of damage for which compensation is allowed. Phillips Petroleum Co. v. Bradley, 205 K. 242, 248, 468 P.2d 95.

9. Subsection (*c*) mentioned in determining rights of condemner in eminent domain proceeding (dissenting opinion). City of Bonner Springs v. Coleman, 206 K. 689, 700, 481 P.2d 950.

10. Legislature intent relating to just compensation and market value (dissenting opinion). State Highway Commission v. Lee, 207 K. 284, 313, 485 P.2d 310.

11. Where plaintiff establishes no "before" and "after" value, verdict not within range established by defendant cannot stand. City of Wichita v. May's Company, Inc., 212 K. 153, 155, 156, 510 P.2d 184.

12. Mentioned; no misconduct in awarding damages where jury added experts' estimated values and divided total obtained by number of experts. Hogue v. Kansas Power & Light Co., 212 K. 339, 345, 347, 510 P.2d 1308.

13. Mentioned; purchase of corporate utility on expiration of franchise is statutory contract right and value not determined under law of eminent domain. City of Kiowa v. Central Telephone & Utilities Corporation, 213 K. 169, 172, 515 P.2d 795.

14. Applied; unit rule method of valuation stated and applied; partial taking; award not based on improper evidence. Rostine v. City of Hutchinson, 219 K. 320, 323, 548 P.2d 756.

15. Compensable damages for taking access to motel; parol evidence upheld. Kohn Enterprises, Inc. v. City of Overland Park, 221 K. 230, 233, 559 P.2d 771.

16. Contention property damaged by factor specified in section; changing street to controlled access facility constituted taking private property for public use. Teachers Insurance & Annuity Ass'n of America v. City of Wichita, 221 K. 325, 329, 559 P.2d 347.

17. Subsection (c) applied; swine producing property did not qualify for "special use" determination of value. *In re* Central Kansas Electric Coop., Inc., 224 K. 308, 316, 317, 582 P.2d 228.

18. Method of establishing value of property upheld; no abuse of discretion in admission of testimony or evidence. Ellis v. City of Kansas City, 225 K. 168, 170, 171, 589 P.2d 552.

19. Subsections (a) and (b) mentioned; error to use the substitute facilities method of determining compensation in eminent domain proceedings against a church's property. Urban Renewal Agency of Wichita v. Gospel Mission Church, 4 K.A.2d 101, 103, 105, 603 P.2d 209.

20. On issue of value jury is not bound by expert opinion evidence; all evidence may be considered. Kansas Power & Light Co. v. Floersch, 4 K.A.2d 440, 608 P.2d 1023.

21. Condemnation proceeding not improper; comparable market values should be used where available. Consultation, Inc. v. City of Lawrence, 5 K.A.2d 486, 487, 619 P.2d 150.

22. Trial court did not abuse discretion in excluding evidence of specific value of leasehold interest but allowing evidence thereof as factor in arriving at value. City of Manhattan v. Kent, 228 K. 513, 517, 618 P.2d 1180.

23. Public fear of power lines held proper consideration in determination of market value. Willsey v. Kansas City Power and Light Co., 6 K.A.2d 599, 615, 631 P.2d 268 (1981).

24. Rights actually acquired by condemner is proper measure of compensation. Barcus v. City of Kansas City, 8 K.A.2d 506, 507, 661 P.2d 806 (1983).

25. Cited; mere plotting and planning in anticipation of a public improvement does not constitute a taking or damaging property. Lone Star Industries, Inc. v. Secretary, Dept. of Transp., 234 K. 121, 123, 671 P.2d 511 (1983).

26. Evidence of comparable sales and various factors herein not authorization to find "before" and "after" values outside range of opinion evidence. Mettee v. Kemp, 236 K. 781, 789, 696 P.2d 947 (1985).

26-514. Fixing of benefit districts and levying of special tax assessments no part of eminent domain procedure. In all cases where costs of the improvement are to be paid for, in whole or in part, by fixing benefit districts or by means of apportionment of benefits on all property benefited, the assessments shall be levied and collected as the statutes now authorize, or may hereafter authorize the assessment, levy and collection of the expense of public improvements, but such special assessments shall not be any part of the condemnation proceedings.

History: L. 1963, ch. 234, § 14; Jan. 1, 1964.

Research and Practice Aids:
Eminent Domain⇐166.
C.J.S. Eminent Domain § 209.

26-515. Same; proceedings pending prior to effective date of this act; invalidity of part. All proceedings or actions under any power of eminent domain pending at the time of the effective date of this act shall be completed in conformity with the laws in effect prior to such date.

If any part or parts of this act shall be held unconstitutional, such unconstitutionality shall not affect the validity of the remaining parts of this act. The legislature hereby declares that it would have passed the remaining parts of this act if it had known that such part or parts thereof would be declared unconstitutional.

History: L. 1963, ch. 234, § 15; Jan. 1, 1964.

Research and Practice Aids:
Eminent Domain⇐167(1).
C.J.S. Eminent Domain § 210 et seq.

26-516. Same; citation of act. This act may be cited as the "eminent domain procedure act."

History: L. 1963, ch. 234, § 16; Jan. 1, 1964.

26-517. Dispute among parties as to division of award or amount of judgment; determination by court. In any action involving the condemnation of real property in which there is a dispute among the parties in interest as to the division of the amount of the appraisers' award or the amount of the final judgment, the district court shall, upon motion by any such party in interest, determine the final distribution of the amount of the appraisers' award or the amount of the final judgment.

History: L. 1969, ch. 196, § 3; July 1.

CASE ANNOTATIONS

1. Final distribution of appraiser's award where dispute arises among inerested parties is judicial matter and appeal will lie. Urban Renewal Agency v. Naegele Outdoor Advertising Co., 208 K. 210, 212, 213, 214, 215, 216, 491 P.2d 886.

2. Trial court did not abuse discretion in excluding evidence of specific value of leasehold interest but allowing evidence thereof as factor in arriving at value. City of Manhattan v. Kent, 228 K. 513, 514, 517, 519, 618 P.2d 1180.

3. Cited in holding 60-2102 does not provide for appeals in original eminent domain proceedings. *In re* Condemnation of Land for State Highway Purposes, 235 K. 676, 682, 683 P.2d 247 (1984).

of fact and conclusions of law held adequate. Duffin v. Patrick, 212 K. 772, 773, 512 P.2d 442.

2. No issue obligating court to make findings of fact; default judgment not void on grounds alleged. Automatic Feeder Co. v. Tobey, 221 K. 17, 22, 558 P.2d 101.

60-252b. Rules of supreme court. The supreme court is hereby authorized and directed to adopt such rules as are necessary, and to require such reports from the district courts or clerks thereof, to insure compliance by such courts with the provisions of K.S.A. 60-252a.

History: L. 1971, ch. 198, § 2; July 1.

CASE ANNOTATIONS

1. Mentioned in breach of contract action; findings of fact and conclusions of law held adequate. Duffin v. Patrick, 212 K. 772, 773, 512 P.2d 442.

60-253. Trial by masters. (a) *Appointment and compensation.* As used in this chapter the word "master" includes a referee, an auditor, a commissioner and an examiner. The compensation to be allowed to a master shall be fixed by the court, and shall be charged upon such of the parties or paid out of any fund or subject matter of the action, which is in the custody and control of the court as the court may direct. The master shall not retain his or her report as security for his or her compensation; but when the party ordered to pay the compensation allowed by the court does not pay it after notice and within the time prescribed by the court, the master is entitled to a writ of execution against the delinquent party. The master must be sworn or affirmed well and faithfully to hear and examine the cause, and to make a just and true report therein, according to the best of the master's understanding. The oath may be administered by any person authorized to take depositions.

(b) *Reference.* With the consent of the parties, all or any issues of fact or law or both may be referred to a master. Otherwise, the judge may order a reference only on a finding that the ends of justice will be measurably advanced thereby, and, in a case triable to a jury, only on such issues as involve an examination of complex or voluminous accounts.

(c) *Powers.* The order of reference to the master may specify or limit the master's powers and may direct him or her to report only upon particular issues or to do or perform particular acts or to receive and report evidence only and may fix the time and place for beginning and closing the hearings and for the filing of the master's report. Subject to the specifications and limitations stated in the order, the master has and shall exercise the power to regulate all proceedings in every hearing before him or her and to do all acts and take all measures necessary or proper for the efficient performance of his or her duties under the order. The master may require the production before him or her of evidence upon all matters embraced in the reference, including the production of all books, papers, vouchers, documents, and writings applicable thereto. The master may rule upon the admissibility of evidence unless otherwise directed by the order of reference and has the authority to put witnesses on oath and may examine them and may call the parties to the action and examine them upon oath. When a party so requests, the master shall make a record of the evidence offered and excluded in the same manner and subject to the same limitations as provided in K.S.A. 60-243 (c) for a court sitting without a jury.

(d) *Proceedings.* (1) *Meetings.* When a reference is made, the clerk shall forthwith furnish the master with a copy of the order of reference. Upon receipt thereof unless the order of reference otherwise provides, the master shall forthwith set a time and place for the first meeting of the parties or their attorneys to be held within twenty (20) days after the date of the order of reference and shall notify the parties or their attorneys. It is the duty of the master to proceed with all reasonable diligence. Either party, on notice to the parties and master, may apply to the court for an order requiring the master to speed the proceedings and to make his or her report. If a party fails to appear at the time and place appointed, the master may proceed *ex parte* or, in the master's discretion, adjourn the proceedings to a future day, giving notice to the absent party of the adjournment.

(2) *Witnesses.* The parties may procure the attendance of witnesses before the master by the issuance and service of subpoenas as provided in K.S.A. 60-245. If without adequate excuse a witness fails to appear or give evidence, he or she may be punished as for a contempt and be subjected to the consequences, penalties, and remedies provided in K.S.A. 60-237 and 60-245.

(3) *Statement of accounts.* When mat-

ters of accounting are in issue before the master, he or she may prescribe the form in which the accounts shall be submitted and in any proper case may require or receive in evidence a statement by a certified public accountant who is called as a witness. Upon objection of a party to any of the items thus submitted or upon a showing that the form of statement is insufficient, the master may require a different form of statement to be furnished, or the accounts or specific items thereof to be proved by oral examination of the accounting parties or upon written interrogatories or in such other manner as he or she directs.

(e) *Report.* (1) *Contents and filing.* The master shall prepare a report upon the matters submitted to him or her by the order of reference and, if required to make findings of fact and conclusions of law, he or she shall set them forth in the report. The master shall file the report with the clerk of the court and in an action to be tried without a jury, unless otherwise directed by the order of reference, shall file with it a transcript of the proceedings and of the evidence and the original exhibits. The clerk shall forthwith mail to all parties notice of the filing.

(2) *In nonjury actions.* In an action to be tried without a jury the court shall accept the master's findings of fact unless clearly erroneous. Within ten (10) days after being served with notice of the filing of the report any party may serve written objections thereto upon the other parties. Application to the court for action upon the report and upon objections thereto shall be by motion and upon notice as prescribed in K.S.A. 60-206 (d). The court after hearing may adopt the report or may modify it or may reject it in whole or in part or may receive further evidence or may recommit it with instructions.

(3) *In jury actions.* In an action to be tried by a jury the master shall not be directed to report the evidence unless required by the court. If the master is available for cross-examination his or her findings upon the issues submitted to him or her are admissible as evidence of the matters found and may be read to the jury, subject to the ruling of the court upon any objections in point of law which may be made to the report.

(4) *Stipulation as to findings.* The effect of a master's report is the same whether or not the parties have consented to the reference; but, when the parties stipulate that a master's findings of fact shall be final, only questions of law arising upon the report shall thereafter be considered.

(5) *Draft report.* Before filing his or her report a master may submit a draft thereof to counsel for all parties for the purpose of receiving their suggestions.

History: L. 1963, ch. 303, 60-253; Jan. 1, 1964.

Source or prior law:

(*a*). G.S. 1868, ch. 80, §§ 294, 298; L. 1909, ch. 182, §§ 301, 304; R.S. 1923, 60-2925, 60-2928.

(*b*). G.S. 1868, ch. 80, §§ 291, 292; L. 1909, ch. 182, §§ 298, 299; R.S. 1923, 60-2922, 60-2923.

(*c*). G.S. 1868, ch. 80, § 293; L. 1909, ch. 182, § 300; R.S. 1923, 60-2924.

Cross References to Related Sections:

Certain stipulations and admissions ineffective unless reduced to writing and signed by counsel, see supreme court rule No. 163 (60-2702a).

Evidence, see 60-243, 60-401 et seq.

Findings, adoption by court, see 60-252(*a*).

Service and filing of pleadings and other papers, see 60-205.

Jury trials, 60-238, 60-239.

Grand juries, see ch. 22, art. 30.

Trials in criminal proceedings, see ch. 22, art. 34.

Jury service and selection of jurors, see 43-155 et seq.

Trial of civil actions, code of civil procedure for limited actions, see 61-1716.

Right to trial by jury, see Bill of Rights, Kan. Const., §§ 5, 10.

Research and Practice Aids:

Federal Civil Procedure⇐1871 et seq.; Reference⇐1 et seq.

C.J.S. Federal Civil Procedure § 890; References § 1 et seq.

Barron & Holtzoff Fed. P. & P. §§ 571, 1001, 1136, 1161 to 1171.

Gard's Kansas C.C.P. 60-253.

Vernon's Kansas C.C.P.—Fowks, Harvey & Thomas, 60-253.

Vernon's Kansas Forms, C.C.P.—Hatcher §§ 2.216, 2.3531 et seq., 2.3556 et seq., 2.3576 et seq., 2.3586 et seq.

CASE ANNOTATIONS

Prior law cases, see G.S. 1949, 60-2922 to 60-2924, 60-2928 and the 1961 Supp. thereto.

1. Master's findings determined to be "clearly erroneous"; "entire evidence" defined. Campbell v. Campbell, 198 K. 181, 187, 190, 422 P.2d 932.

2. Appraiser appointed under K.S.A. 17-6712(e) receives power and authority conferred upon a master hereunder. Moore v. New Ammest, Inc., 6 K.A.2d 461, 466, 470, 471, 630 P.2d 167 (1981).

60-254. Judgments. (a) *Definition.* A judgment is the final determination of the rights of the parties in an action.

(b) *Judgment upon multiple claims.*

Volume 2

Appendix 5—K.S.A 17-1350

or loans secured by real estate mortgages, and stocks, preferred or common, which men of prudence, discretion and intelligence acquire or retain for their own account, and within the limitations of the foregoing, the governing board of the cemetery corporation may retain property properly acquired, without limitation as to time and without regard to its suitability for original purchase: *Provided*, That it may be permissible for such governing body of such a cemetery to invest its funds for perpetual care or permanent maintenance in the erection of a mausoleum upon its grounds or for the partial expense for the erection thereof.

History: L. 1951, ch. 215, § 2; June 30.

Cross References to Related Sections:

Prudent-man rule for fiduciaries, see 17-5004.

17-1350. Dissolution of certain cemetery districts; determination of facts. Whenever any public utility, governmental agency of this state, or the United States, having the power of eminent domain, shall have determined it to be necessary to acquire for public use the existing property owned by any cemetery district in this state, the directors of such cemetery district may present a petition to the district court of the county in which such cemetery property is located, verified by such directors, setting forth such facts and praying that an order be made by the court determining whether such facts exist.

History: L. 1953, ch. 137, § 1; March 27.

17-1351. Same; findings; notice to owners of intention to dissolve district. Such petition shall be heard immediately by such district court, and if the district court shall find that the facts specifically set out in K.S.A. 17-1350 exist, the court shall direct that process be issued in said action notifying all persons owning lots or places of burial in such cemetery, as far as can be determined from the records of such cemetery district, of the intention of the cemetery district to request the dissolution of such cemetery district, such process to be issued by personal service or by publication service in accordance with sections 60-2525 to 60-2527, both sections inclusive, of the General Statutes Supplement of 1951.

History: L. 1953, ch. 137, § 2; March 27.

17-1352. Same; hearing; determination; authority to contract, when. After service, as provided in the preceding section, has been made, a hearing shall be had by said district court, to determine whether such cemetery district should be dissolved, and the property rights of persons living or dead either owning cemetery lots in said cemetery, or buried therein, shall be dissolved and set aside, and, whether it would be to the best interests of all parties concerned for said bodies to be disinterred from said cemetery and reburied in another cemetery or cemeteries. If the court shall find in the affirmative, then the directors of such cemetery district shall be authorized to enter into a contract or contracts for the sale of such cemetery property to such governmental agency or public utility, subject to the approval of the court, and also to enter into a contract or contracts for the removal and reburial of all persons buried in said cemetery, subject to the approval of the court.

History: L. 1953, ch. 137, § 3; March 27.

17-1353. Same; acquisition of locations in certain existing cemeteries. The directors of such cemetery district shall then be authorized to acquire by purchase suitable cemetery lots, or burial locations in other existing cemeteries within a radius of fifty (50) miles of such cemetery, for the reburial of all bodies in such cemetery.

History: L. 1953, ch. 137, § 4; March 27.

17-1354. Same; dissolution of district by court, when; deed; report, approval; order; recordation. Upon the removal and reburial of all bodies, together with the relocation of all markers, monuments and other identifying medium, the court shall be advised of such fact by the directors of such cemetery district, and, if the court finds all of the terms of said contract or contracts have been carried out, the court can declare such cemetery district to be dissolved, and authorize the directors of such cemetery district to execute a deed to such cemetery property to the governmental agency involved. The directors of such cemetery district shall report all payments to the court, and, if approved by the court, the court shall order such cemetery district to pay all costs and expenses from the money received for the sale of such property, a copy of which order shall be filed with the county clerk of the county or counties in which such cemetery district is located, and thereupon such cemetery district shall cease to become a taxing unit.

History: L. 1953, ch. 137, § 5; March 27.

Volume2

Appendix 6—K.S.A. 82a-708b

section for the appropriate category of acre feet in accordance with the following:

Acre Feet	Fee
0 to 100	$100
101 to 320	$150
More than 320	$150 + $10 for each additional 100 acre feet or any part thereof

(c) Except as otherwise provided in subsection (d), each application for a permit to appropriate water for storage, except applications for permits for domestic use, shall be accompanied by an application fee fixed by this section for the appropriate category of storage-acre feet in accordance with the following:

Storage-Acre Feet	Fee
0 to 250	$100
More than 250	$100 + $10 for each additional 250 storage-acre feet or any part thereof

(d) For any application for a permit to appropriate water, except applications for permits for domestic use, which proposes to appropriate by both direct flow and storage, the fee charged shall be the fee under subsection (b) or subsection (c), whichever is larger, but not both fees.

(e) All fees collected by the chief engineer pursuant to this section shall be remitted to the state treasurer as provided in K.S.A. 82a-731 and amendments thereto.

History: L. 1957, ch. 539, § 3; L. 1973, ch. 414, § 1; L. 1982, ch. 4, § 17; L. 1985, ch. 339, § 1; July 1.

Law Review and Bar Journal References:

"Legal Aspects of Water Storage in Federal Reservoirs in Kansas," John C. Peck, 32 K.L.R. 785 (1984).

"The Parting of the Waters—The Dispute Between Colorado and Kansas Over the Arkansas River," Mark J. Wagner, 24 W.L.J. 99 (1984).

82a-708b. Same; applications to change place of use; appeal from decisions of chief engineer; fee. (a) Any owner of a water right may change the place of use, the point of diversion or the use made of the water, without losing priority of right, provided such owner shall: (1) Apply in writing to the chief engineer for approval of any proposed change; (2) demonstrate to the chief engineer that any proposed change is reasonable and will not impair existing rights; (3) demonstrate to the chief engineer that any proposed change relates to the same local source of supply as that to which the water right relates; and (4) receive the approval of the chief engineer with respect to any proposed change. The chief engineer shall approve or reject the application for change in accordance with the provisions and procedures prescribed for processing original applications for permission to appropriate water. If the chief engineer disapproves the application for change, the rights, priorities and duties of the applicant shall remain unchanged. Any person aggrieved by an order or decision by the chief engineer relating to an application for change may appeal to the district court in the manner prescribed by K.S.A. 82a-724 and amendments thereto.

(b) Each application to change the place of use, the point of diversion or the use made of the water under this section shall be accompanied by a fee of $50. All fees collected by the chief engineer pursuant to this section shall be remitted to the state treasurer as provided in K.S.A. 82a-731 and amendments thereto.

History: L. 1957, ch. 539, § 4; L. 1982, ch. 4, § 18; L. 1985, ch. 339, § 2; July 1.

82a-711. Applications for permits to appropriate water; duties of chief engineer as to applications. (a) If a proposed use neither impairs a use under an existing water right nor prejudicially and unreasonably affects the public interest, the chief engineer shall approve all applications for such use made in good faith in proper form which contemplate the utilization of water for beneficial purpose, within reasonable limitations except that the chief engineer shall not approve any application submitted for the proposed use of fresh water in any case where other waters are available for such proposed use and the use thereof is technologically and economically feasible. Otherwise, the chief engineer shall make an order rejecting such application or requiring its modification to conform to the public interest to the end that the highest public benefit and maximum economical development may result from the use of such water.

(b) In ascertaining whether a proposed use will prejudicially and unreasonably affect the public interest, the chief engineer shall take into consideration:

(1) Established minimum desirable streamflow requirements;

(2) the area, safe yield and recharge rate of the appropriate water supply;

(3) the priority of existing claims of all

Volume2

Appendix 7—General Warranty Deeds

GENERAL WARRANTY DEED

FEE SIMPLE ESTATE

This Indenture, Made this day of A.D., 19 , between

of County, in the State of Kansas of the first part, and The State of Kansas, Department of Commerce, acting through the Secretary of Commerce of Shawnee County, in the State of Kansas of the second part,

WITNESSETH, That said party of the first part, in consideration of the sum of Dollars the receipt whereof is hereby acknowledged, do by these presents grant, bargain, sell and convey unto said party of the second part, his successors and assigns, all the following-described real estate situated in the County of and State of Kansas, to wit:

TO HAVE AND TO HOLD THE SAME, Together with all and singular the tenements, hereditaments and appurtenances thereunto belonging or in anywise appertaining, forever.

And said for , heirs, executors or administrators, do hereby covenant, promise and agree, to and with said

party of the second part, that at the delivery of these presents lawfully seized in own right, of an absolute and indefeasible estate of inheritance, in fee simple, of and in all and singular the above granted and described premises, with the appurtenances; that the same are free, clear, discharged and unincumbered of and from all former and other grants, titles, charges, estates, judgements, taxes, assessments and incumbrances, of what nature or kind soever; and that will warrant forever defend the same unto said party of the second part, his successor and assigns, against said party of the first part, heirs, and all and every person or persons whomsoever, lawfully claiming or to claim the same.

IN WITNESS WHEREOF, The said party of the first party ha hereunto set hand , the day and year first above written.

_____

_____

_____

_____

STATE OF KANSAS)
) SS
COUNTY OF)

BE IT REMEMBERED, That on this day of A.D. 19 before me, the undersigned, a in and for the County and State aforesaid, came

who personally known to me to be the same person who executed the within instrument of writing, and such person duly acknowledged the execution of the same.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my seal, the day and year last above written.

_____
Notary Public

My Appointment Expires:

_____

GENERAL WARRANTY DEED

STRATIFIED FEE ESTATE

This Indenture, Made this day of , A.D. 19 , between

of County, in the State of Kansas of the first part, and The State of Kansas, Department of Commerce, acting through the Secretary of Commerce of Shawnee County, in the State of Kansas of the second part,

WITNESSETH, That said party of the first part, in consideration of the sum of Dollars the receipt whereof is hereby acknowledged, do by these presents grant, bargain, sell and convey unto said party of the second part, his successors and assigns, a stratified fee estate to the

situated in the County of and State of Kansas, to wit:

A stratified fee simple estate to a subterranean volume of space described as that volume of space lying between _____ mean sea level and _____ mean sea level which is _____ feet horizontally either side of a line at _____ mean sea level which line enters the

above described surface tract at a point _____ feet _____ of the _____ corner of said tract, which line thence proceeds along an arc to the right with a radius of _____ feet and exits said tract at a point _____ feet _____ of the _____ corner of said tract.

TO HAVE AND TO HOLD THE SAME, Together with all and singular the tenements, hereditaments and appurtenances thereunto belonging or in anywise appertaining, forever.

And said

for , heirs, executors or administrators, do hereby covenant, promise and agree, to and with said party of the second part, that at the delivery of these presents lawfully seized in own right, of an absolute and indefeasible estate of inheritance, in fee simple, of and in all and singular the above granted and described premises, with the appurtenances; that the same are free, clear, discharged and unencumbered of and from all former and other grants, titles, charges, estates, judgements, taxes, assessments and encumbrances, of what nature or kind soever;

and that will warrant and forever defend the same unto said party of the second part, his successors and assigns, against said party of the first part, heirs, and all and every person or persons whomsoever, lawfully claiming or to claim the same.

IN WITNESS WHEREOF, The said party of the first part has hereunto set hand , the day and year first above written.

_____

_____

_____

_____

STATE OF KANSAS)
) SS.
COUNTY OF)

BE IT REMEMBERED, That on this day of A.D., 19 , before me, the undersigned a in and for the County and State aforesaid, same

who personally known to me to be the same person who executed the within instrument of writing, and such person duly acknowledged the execution of the same.

IN TSTIMONY WHEREOF, I have hereunto set my hand and affixed my seal, the day and year last above written.

_____
Notary Public

My Appointment Expires:

_____

GENERAL WARRANTY DEED OF EASEMENT

ACCESS ROAD EASEMENT

This Indenture, Made this day of A.D., 19 , between

of County, in the State of Kansas of the first part, and The State of Kansas, Department of Commerce, acting through the Secretary of Commerce of Shawnee County, in the State of Kansas of the second part,

WITNESSETH, That said party of the first part, in consideration of the sum of Dollars the receipt whereof is hereby acknowledged, do by these presents grant, bargain, sell and convey unto said party of the second part, his successors and assigns, all the following described estates, to wit:

A perpetual and assignable easement and right of way to locate, construct, operate, maintain, and repair a roadway and utility line in, upon, over and across the land described in Schedule "A", together with the right to trim, cut, fell and remove therefrom all trees, underbrush, obstructions, and any other vegetation, structures, or obstacles within the limits of the right of way; subject, however, to existing easements for public roads and highways, public utilities, railroads and pipelines; reserving, however, to the landowner, heirs, executors, administrators, successors, and assigns the right to use the surface of such land as access to their adjoining land.

And said

for , heirs, executors or administrators, do hereby covenant, promise and agree, to and with said party of the second part, that at the delivery of these presents lawfully seized in own right, of an absolute and indefeasible estate of inheritance, in fee simple, of and in all and singular the above granted and described premises, with the appurtenances; that the same are free, clear, discharged and unincumbered of and from all former and other grants, titles, charges, estates, judgements, taxes, assessments and incumbrances, of what nature or kind soever; and that will warrant forever defend the same unto said party of the second part, his successor and assigns, against said party of the first part, heirs, and all and every person or persons whomsoever, lawfully claiming or to claim the same.

IN WITNESS WHEREOF, The said party of the first party ha hereunto set hand , the day and year first above written.

_____

_____

_____

_____

STATE OF KANSAS)
) SS
COUNTY OF)

BE IT REMEMBERED, That on this day of A.D. 19 before me, the undersigned, a in and for the County and State aforesaid, came

who personally known to me to be the same person who executed the within instrument of writing, and such person duly acknowledged the execution of the same.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my seal, the day and year last above written.

_____
Notary Public

My Appointment Expires:

_____

GENERAL WARRANTY DEED OF EASEMENT

SPOIL AREA EASEMENT

This Indenture, Made this day of A.D., 19 , between

of County, in the State of Kansas of the first part, and The State of Kansas, Department of Commerce, acting through the Secretary of Commerce of Shawnee County, in the State of Kansas of the second part,

WITNESSETH, That said party of the first part, in consideration of the sum of Dollars the receipt whereof is hereby acknowledged, do by these presents grant, bargain, sell and convey unto said party of the second part, his successors and assigns, all the following described estates, to wit:

The temporary easement and right-of-way for a period not to exceed _____, in, over, and across the following described tract: _____

_____

_____ County, Kansas, for the purpose of depositing waste material thereon in connection with the construction, operation and maintenance of the Superconducting Super Collider project; together with the right of access to and egress from said tract and to trim, cut, fell and remove timber, underbrush and other vegetation, structures, and any other obstructions or obstacles; reserving, however, to the owners of the said land, their heirs, administrators, executors, successors, and assigns, all such rights and privileges as may be used and enjoyed without interfering with or abridging the rights and easements hereby acquired; the above estate is taken subject to existing easements for public roads and highways, public utilities, railroads and pipelines.

And said

for , heirs, executors or administrators, do hereby covenant, promise and agree, to and with said party of the second part, that at the delivery of these presents lawfully seized in own right, of an absolute and indefeasible estate of inheritance, in fee simple, of and in all and singular the above granted and described premises, with the appurtenances; that the same are free, clear, discharged and unincumbered of and from all former and other grants, titles, charges, estates, judgements, taxes, assessments and incumbrances, of what nature or kind soever; and that will warrant forever defend the same unto said party of the second part, his successor and assigns, against said party of the first part, heirs, and all and every person or persons whomsoever, lawfully claiming or to claim the same.

IN WITNESS WHEREOF, The said party of the first party ha hereunto set hand , the day and year first above written.

_____

_____

_____

_____

STATE OF KANSAS)
) SS
COUNTY OF)

BE IT REMEMBERED, That on this day of A.D. 19 before me, the undersigned, a in and for the County and State aforesaid, came

who personally known to me to be the same person who executed the within instrument of writing, and such person duly acknowledged the execution of the same.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my seal, the day and year last above written.

_____
Notary Public

My Appointment Expires:

_____

GENERAL WARRANTY DEED OF EASEMENT

SURFACE UTILITY EASEMENT

This Indenture, Made this day of A.D., 19 , between

of County, in the State of Kansas of the first part, and The State of Kansas, Department of Commerce, acting through the Secretary of Commerce of Shawnee County, in the State of Kansas of the second part,

WITNESSETH, That said party of the first part, in consideration of the sum of Dollars the receipt whereof is hereby acknowledged, do by these presents grant, bargain, sell and convey unto said party of the second part, his successors and assigns, all the following described estates, to wit:

A perpetual and assignable easement and right-of-way to locate, construct, operate, maintain, repair, patrol and remove utilities, overhead electric line, in, upon, over and across (the land described in Schedule "A"), together with the right to trim, cut fell and remove therefrom all trees, underbrush, obstructions, and any other vegetation, structures or obstacles with the limits of the right-of-way; subject, however, to existing easements for public roads and highways, public utilities, railroads and pipelines; reserving, however, to the landowner, (his/her/its/their) heirs, executors, administrators, successors, and assigns all right, title, interest and privilege as may be exercised and enjoyed without interference with or abridgement of the easement and right hereby taken for said public uses.

And said -

for , heirs, executors or administrators, do hereby covenant, promise and agree, to and with said party of the second part, that at the delivery of these presents lawfully seized in own right, of an absolute and indefeasible estate of inheritance, in fee simple, of and in all and singular the above granted and described premises, with the appurtenances; that the same are free, clear, discharged and unincumbered of and from all former and other grants, titles, charges, estates, judgements, taxes, assessments and incumbrances, of what nature or kind soever; and that will warrant forever defend the same unto said party of the second part, his successor and assigns, against said party of the first part, heirs, and all and every person or persons whomsoever, lawfully claiming or to claim the same.

IN WITNESS WHEREOF, The said party of the first party ha hereunto set hand , the day and year first above written.

_____

_____

_____

_____

STATE OF KANSAS)
) SS
COUNTY OF)

BE IT REMEMBERED, That on this day of A.D. 19 before me, the undersigned, a in and for the County and State aforesaid, came

who personally known to me to be the same person who executed the within instrument of writing, and such person duly acknowledged the execution of the same.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my seal, the day and year last above written.

_____
Notary Public

My Appointment Expires:

_____

GENERAL WARRANTY DEED OF EASEMENT

MOBILIZATION AND STORAGE AREA EASEMENT

This Indenture, Made this day of A.D., 19 , between

of County, in the State of Kansas of the first part, and The State of Kansas, Department of Commerce, acting through the Secretary of Commerce of Shawnee County, in the State of Kansas of the second part,

WITNESSETH, That said party of the first part, in consideration of the sum of Dollars the receipt whereof is hereby acknowledged, do by these presents grant, bargain, sell and convey unto said party of the second part, his successors and assigns, all the following described estates, to wit:

The temporary easement and right-of-way for a period not to exceed _____, in, over, under, and across the following described tract: _____

_____

_____ County, Kansas, for the purpose of construction site mobilization including the excavation of incline tunnels to the mean sea level of the collider tunnel and for the right to store materials, supplies and equipment incident to the construction, operation and maintenance of the Superconducting Super Collider project; together with the right of access to and egress from said tract and to trim, cut, fell and remove timber, underbrush and other vegetation, structures, and any other obstructions or obstacles; reserving, however, to the owners of the said land, their heirs, administrators, executors, successors, and assigns, all such rights and privileges as may be used and enjoyed without interfering with or abridging the rights and easements hereby acquired; the above estate is taken subject to existing easements for public roads and highways, public utilities, railroads and pipelines.

And said

for , heirs, executors or administrators, do hereby covenant, promise and agree, to and with said party of the second part, that at the delivery of these presents lawfully seized in own right, of an absolute and indefeasible estate of inheritance, in fee simple, of and in all and singular the above granted and described premises, with the appurtenances; that the same are free, clear, discharged and unincumbered of and from all former and other grants, titles, charges, estates, judgements, taxes, assessments and incumbrances, of what nature or kind soever; and that will warrant forever defend the same unto said party of the second part, his successor and assigns, against said party of the first part, heirs, and all and every person or persons whomsoever, lawfully claiming or to claim the same.

IN WITNESS WHEREOF, The said party of the first party ha hereunto set hand , the day and year first above written.

_____

_____

_____

_____

STATE OF KANSAS)
) SS
COUNTY OF)

BE IT REMEMBERED, That on this day of A.D. 19 before me, the undersigned, a in and for the County and State aforesaid, came

who personally known to me to be the same person who executed the within instrument of writing, and such person duly acknowledged the execution of the same.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my seal, the day and year last above written.

_____
Notary Public

My Appointment Expires:

_____

Volume 2

Appendix 8—K.S.A. 68-102

statutes on the subject. Shane v. City of Hutchinson, 88 K. 188, 190, 127 P. 606.

2. Location of road determinable from county records. The State, *ex rel.*, v. Paul, 112 K. 826, 213 P. 165.

LAYING OUT AND OPENING ROADS

68-102. Petition for laying out, viewing, altering or vacating roads; bond; vacation in certain counties without petition. Applications for laying out roads, or for viewing, reviewing, altering or vacating any road, shall be by petition to the board of county commissioners, signed by at least twelve (12) householders of the county residing in the vicinity where said road is to be laid out, viewed, reviewed, altered or vacated; and one or more of the signers of any petition presented as aforesaid shall enter into a bond with sufficient sureties, payable to the state of Kansas for the use of the county, to be approved by the county commissioners, conditioned that the person signing such bond shall pay into the treasury of the county the amount of all costs and expenses accruing on said location, view, review, alteration or vacation, in case the proceedings had in pursuance of said petition shall not be finally confirmed and established; and on neglect or refusal of the persons so bound, after a liability shall have accrued, the county clerk of the county shall collect or cause to be collected such costs and expenses, and pay the same into the county treasury: *Provided,* That in counties having a population of not more than ninety thousand (90,000) and not less than twelve hundred (1,200) inhabitants, the board of county commissioners are hereby given authority to vacate any road of such county without such petition being signed and presented to them and without the signer of bond as provided herein when, in their judgment, said road is not a public utility by reason of neglect, nonuse, or inconvenience or from other cause or causes said road has become practically impassable and the necessity for said road as a public utility does not justify the expenditure of the necessary funds to repair said road or put the same in condition for public travel: *Provided further,* That no more than two consecutive miles of road shall be vacated at any one time.

History: L. 1911, ch. 248, § 2; R.S. 1923, 68-102; L. 1931, ch. 243, § 1; L. 1945, ch. 265, § 1; L. 1951, ch. 374, § 1; June 30.

Source or prior law:

L. 1864, ch. 112, § 1; G.S. 1868, ch. 89, § 1; L. 1874, ch. 108, § 1.

Research and Practice Aids:

Highways⇐29(1), 44(1), 75(1).

C.J.S. Highways §§ 48.64 et seq., 113 et seq.

Petition and bond for laying out, etc., of road, Vernon's Kansas Forms §§ 9392, 9393.

CASE ANNOTATIONS

Annotations to L. 1874, ch. 108, § 1, and former laws:

1. Public acquires only an easement in the land. Comm'rs of Shawnee Co. v. Beckwith, 10 K. 603, 607.

2. Nature of evidence necessary to prove use as public highway. Cemetery Association v. Meninger, 14 K. 312.

3. Misdescription of road in bond will not vitiate proceedings. Casey v. Kilgore, 14 K. 478.

4. Petition necessary to confer jurisdiction; proceedings void unless jurisdiction obtained. Comm'rs of Wabaunsee Co. v. Muhlenbacker, 18 K. 129; Oliphant v. Comm'rs of Atchison Co., 18 K. 386.

5. Public cannot acquire by prescription any sooner than an individual. Oliphant v. Comm'rs of Atchison Co., 18 K. 386.

6. Principal petitioner is necessary party to proceedings in error. Commissioners of Chase Co. v. Carter, 24 K. 511.

7. Not established by prescription over government lands or open prairie. Smith v. Smith, 34 K. 293, 8 P. 385.

8. Land cannot be dedicated for road until complete title obtained. Smith v. Smith, 34 K. 293, 8 P. 385.

9. Petition necessary to confer jurisdiction; proceedings void unless jurisdiction obtained. Shaffer v. Weech, 34 K. 595, 9 P. 202.

10. Proceedings held valid without express finding that petitioners were householders. Schade v. Theel, 45 K. 628, 26 P. 38.

11. Petition necessary to confer jurisdiction upon commissioners. Mills v. Comm'rs of Neosho Co., 50 K. 635, 32 P. 361.

12. Commissioners granting petition cannot reconsider and vacate such road. Mills v. Comm'rs of Neosho Co., 50 K. 635, 32 P. 361.

13. Maintenance of fence sufficient to prevent prescriptive right from attaching. The State v. Cipra, 71 K. 714, 81 P. 488.

14. Vacation of road under provisions of section considered. The State, *ex rel.*, v. Cowley County, 87 K. 732, 737, 125 P. 23.

Annotations to L. 1911, ch. 248, § 2 and amendments:

15. Phrase "vicinity of the road," construed. Canaday v. Scott County, 104 K. 785, 786, 181 P. 121.

16. Petition for public road; residence of petitioner; statute interpreted. Sterling v. Finney County, 105 K. 423, 424, 185 P. 11.

17. Procedure for vacating roads is same as procedure for laying out road. Heatherman v. Kingman County Comm'rs, 123 K. 77, 78, 254 P. 321.

18. Statute governs changes made in public road avoiding turns or dangerous places. Ruff v. Shawnee County Comm'rs, 127 K. 188, 200, 272 P. 189.

19. Railroad not required to restore crossing unless sufficient inconvenience shown. State, *ex rel.*, v. Thompson, 148 K. 196, 199, 80 P.2d 1070.

20. Section mentioned but not applied or construed. City of Hutchinson v. Wagoner, 163 K. 735, 740, 186 P.2d 243.

21. City cannot vacate township roads. Wagoner v. City of Hutchinson, 169 K. 44, 47, 216 P.2d 808.

22. Cited; review of certain statutes applicable to township roads. Clay Township v. Pebley, 207 K. 59, 60, 61, 483 P.2d 1101.

23. When a board of county commissioners orders the vacation of a road, the action is administrative and not appealable without statutory authority. *In re* Helbach, 6 K.A.2d 39, 626 P.2d 1192.

68-102a. Notice required on vacation without a petition; damages. Before any road is vacated without the presentation of a petition for vacation, the county clerk shall give notice of the proposed vacation by publication once in the official county newspaper and by sending notice by certified mail to each owner of property adjoining the road, at the address where the owner's tax statement is sent. The notice shall set forth a description of the road proposed to be vacated. Proceedings for the award of damages, if any, to the property owners affected by vacation of any road as provided for in this act, and appeal therefrom, shall be made in the same manner as provided in K.S.A. 68-107. Any person or persons may make written application to the county commissioners for payment for damage to property caused by the vacation. The county commissioners shall not award damages on account of the vacation unless there has been filed with the county clerk, within 12 months after the entering of the order of vacation, a written application giving a description of the premises for which damages or compensation are claimed. The county commissioners shall determine the amount of damage sustained, if any, by such claimant. All applications for damages shall be forever barred unless they are presented as provided by this act.

History: L. 1931, ch. 243, § 2; L. 1981, ch. 173, § 67; July 1.

Research and Practice Aids:
Highways⇐77(3)
C.J.S. Highways § 119.

68-103. Petition, contents. All petitions for laying out or altering a road shall specify the place of beginning, the intermediate points, if any, and the place of termination of such road.

History: L. 1911, ch. 248, § 3; May 22; R.S. 1923, 68-103.

Source or prior law:
L. 1864, ch. 112, § 2; G.S. 1868, ch. 89, § 2; L. 1874, ch. 108, § 2.

68-104. Viewers; notice of view; duties of county surveyor. Upon presentation of any petition for a road, or for the alteration or vacation of any road, to the county commissioners, at any regular session of their board, it shall be the duty of said commissioners, if they find the petition to be a legal one, and that the proper bond has been filed, to appoint three disinterested householders of the county as viewers with said commissioners, who may act as viewers of said road, and the county clerk shall give notice by advertisement set up in the county clerk's office and in every municipal township through which any part of said road is designed to be laid out, altered, or vacated, for at least twenty days, and by publication for two consecutive weeks in a newspaper of general circulation in the county setting forth that such petition has been presented, giving the substance thereof, and that the commissioners or the viewers, on the day designated, which shall not be more than twenty days after the date of the second publication in the newspaper of the notice herein required, will proceed to view the said road, and give all parties a hearing.

They shall also cause a record of such notice to be entered on their journal by the county clerk. They shall issue an order directing the county surveyor to meet with them at the time and place named in said notice to survey such road. In case of failure to meet on the day designated, they may meet on the following day, without further notice; and in case of failure to meet within the time herein specified, new notice shall be given as hereinbefore provided; that in all applications for the location, change and relocation of any road to be located upon or along any section line, and the petition shall so state, and shall specify the section lines to be followed, the place of beginning and the place of ending, the survey may be dispensed with, and in case the owners of the lands taken agree in writing to the proposed location, relocation, or change, and the commissioners are satisfied that the location, relocation or change prayed for is practicable, and can be made without unreasonable expense, they may dispense

with the viewing of such location, relocation or change of road, and shall order the same to be surveyed, platted and opened, and shall also direct the county engineer to note such location, relocation or change of roads upon the road records of his office.

History: L. 1911, ch. 248, § 4; May 22; R.S. 1923, 68-104.

Source or prior law:

L. 1864, ch. 112, § 3; G.S. 1868, ch. 89, § 3; L. 1872, ch. 175, § 1; L. 1874, ch. 108, § 3; L. 1903, ch. 411, § 1.

Research and Practice Aids:

Highways⇐37(1).

C.J.S. Highways § 56.

Notice of petition for road, etc., Vernon's Kansas Forms § 9394.

CASE ANNOTATIONS

Annotations to L. 1874, ch. 108, § 3, and former laws:

1. Judicial nature of proceedings; not invalidated by mere immaterial irregularities. Willis v. Sproule, 13 K. 257.

2. Petition necessary to confer jurisdiction proceedings void unless jurisdiction obtained. Comm'rs of Wabaunsee Co. v. Muhlenbacker, 18 K. 129; Oliphant v. Comm'rs of Atchison Co., 18 K. 386.

3. Notice waived and claim presented; landowner cannot afterwards question proceedings. Ogden v. Stokes, 25 K. 517.

4. Legislature may establish roads, etc., and cast expense upon county. The State, *ex rel.*, v. Comm'rs of Shawnee Co., 28 K. 431.

5. Notice is jurisdictional; commissioners cannot vacate road unless notice given. Troy v. Comm'rs of Doniphan Co., 32 K. 507, 4 P. 1009.

6. Order laying out or vacating road void unless notice given. Crawford v. Comm'rs of Elk Co., 32 K. 555, 4 P. 1011.

7. Opening or vacating roads; records of board as evidence. Crawford v. Comm'rs of Elk Co., 32 K. 555, 4 P. 1011.

8. Jurisdiction exhausted when viewers appointed until other jurisdictional facts appear. The State v. Horn, 34 K. 556, 9 P. 208.

9. Report of viewers; courts construe proceedings strictly relative to jurisdiction. The State v. Horn, 34 K. 556, 9 P. 208.

10. Failure to give notice; landowner participating in proceedings cannot object. Akin v. Comm'rs of Riley Co., 36 K. 170, 13 P. 2.

11. Mortgagor in possession of land regarded as owner; notices, etc. Goodrich v. Comm'rs of Atchison Co., 47 K. 355, 27 P. 1006.

Annotations to L. 1903, ch. 411, § 1:

12. Proceedings not void because road designated as private road. Howard v. Schmidt, 70 K. 640, 79 P. 142.

13. Order of commissioners operates as acceptance of congressional grant. Molyneux v. Grimes, 78 K. 830, 98 P. 278.

14. Record of notice of meeting of viewers; copy notice sufficient. Molyneux v. Grimes, 78 K. 830, 98 P. 278.

15. Proof of publication of notice unnecessary; presumption of regularity. Molyneux v. Grimes, 78 K. 830, 98 P. 278.

16. Meeting of commissioners to elect chairman deemed "regular meeting." Molyneux v. Grimes, 78 K. 830, 98 P. 278.

17. Road held regularly laid out although record of proceedings defective. Guthrie v. Atchison County, 94 K. 584, 588, 146 P. 1157.

Annotations to L. 1911, ch. 248, § 4:

18. Award under 68-114; appeal dismissed; duty of board to pay. Larkin v. Nemaha County Comm'rs, 170 K. 164, 170, 223 P.2d 987.

19. Cited; review of certain statutes applicable to township roads. Clay Township v. Pebley, 207 K. 59, 61, 483 P.2d 1101.

68-105. Notice by petitioner; affidavits of service; filing. It shall be the duty of at least one of the petitioners to cause six days' notice to be given in writing to the owner or owners or their agents, if residing in the county, or if such owner be a minor, idiot or insane person, then to the guardian of such person, if a resident of the county, through whose land such road is proposed to be laid out and established, and also six days' notice to the county surveyor of the time and place of meeting, as specified in the notice of the commissioners. Copies of said notice of lands, with affidavits of service attached, shall be filed in the county clerk's office before said road shall be established.

History: L. 1911, ch. 248, § 5; May 22; R.S. 1923, 68-105.

Source or prior law:

L. 1864, ch. 112, § 4; G.S. 1868, ch. 89, § 4; L. 1872, ch. 175, § 2; L. 1874, ch. 108, § 4.

Research and Practice Aids:

Affidavit of service of notice on property owners and county surveyor, Vernon's Kansas Forms § 9397.

Certificate of assessment of damages, Vernon's Kansas Forms § 9398.

Notice to be served on,

County surveyor, Vernon's Kansas Forms § 9396.

Property owners, Vernon's Kansas Forms § 9395.

CASE ANNOTATIONS

Annotations to L. 1874, ch. 108, § 4:

1. Highway cannot be established until notice with affidavits, etc., filed. The State v. Farry, 23 K. 731.

2. Commissioners cannot establish highway through land unless notice properly served. Comm'rs of Chase Co. v. Carter, 30 K. 581, 1 P. 814; Bourbon County v. Ralston, 79 K. 432, 100 P. 288.

3. Want of notice cured by presentation of claim for damages. Comm'rs of Woodson Co. v. Heed, 33 K. 34, 5 P. 453.

4. Want of notice; commissioners cannot revoke order after claim presented. Comm'rs of Woodson Co. v. Heed, 33 K. 34, 5 P. 453.

5. Want of notice cured by general appearance before county board. Stephens v. Comm'rs of Leavenworth Co., 36 K. 664, 14 P. 175.

6. Mortgagor in possession regarded as owner of the

land. Goodrich v. Comm'rs of Atchison Co., 47 K. 355, 27 P. 1006.

7. Notice to nonresident owners considered. Goodrich v. Comm'rs of Atchison Co., 47 K. 355, 365, 27 P. 1006.

8. Railway company resident of county in which it operates road. The State v. Bogardus, 63 K. 259, 65 P. 251.

9. Notice required by section is jurisdictional. The State v. Bogardus, 63 K. 259, 65 P. 251.

10. Parties occupying homestead; title in husband; wife not owner. Matthewson v. Skinner, 66 K. 309, 71 P. 580.

11. Recital in report of viewers concerning claim may be contradicted. Howard v. Schmidt, 70 K. 640, 79 P. 142.

12. Criminal prosecution for obstructing road; burden of showing due establishment. The State v. Cipra, 71 K. 714, 81 P. 488.

13. Injunction to prevent opening of road when notice not given. Bourbon County v. Ralston, 79 K. 432, 100 P. 288.

14. Appeal from allowance of claim pending; appeal under 19-223 dismissed. Flagel v. Jackson County, 83 K. 709, 112 P. 622.

Annotations to L. 1911, ch. 248, § 5:

15. Residence of railroad in county where it operates line considered. Kimmerle v. City of Topeka, 88 K. 370, 128 P. 367.

16. Railroad corporation operating within county entitled to notice upon agent. Kimmerle v. City of Topeka, 88 K. 370, 373, 128 P. 367.

17. Personal service not required where owner continually absent from county. Guthrie v. Atchison County, 94 K. 584, 588, 146 P. 1157.

18. Service on tenant in common in charge of land sufficient. Guthrie v. Atchison County, 94 K. 584, 588, 146 P. 1157.

19. Finding of validity of proceedings not overthrown because affidavits lost. The State, *ex rel.*, v. Railway Co., 95 K. 22, 23, 147 P. 801.

20. Affidavits showing service not found in office of clerk; presumption. The State, *ex rel.*, v. Railway Co., 95 K. 22, 147 P. 801.

21. No notice of view of life tenant; proceedings void. Brown v. Anderson County, 100 K. 319, 323, 164 P. 288.

22. Cited; review of certain statutes applicable to township roads. Clay Township v. Pebley, 207 K. 59, 61, 483 P.2d 1101.

68-106. Viewing, surveying, laying out, altering or vacating road; assessment of damages; application for damages, when; filing, survey and plat. It shall be the duty of the commissioners or said viewers or a majority of them, and the county surveyor to meet at the time and place specified in the notice aforesaid, or on the following day thereafter, and they may, if they deem it necessary, take to their assistance two suitable persons as chain carriers and one as marker, and then proceed to view, survey, lay out, alter or vacate the road as prayed for in said petition, or as nearly so as a good road can be made at a reasonable expense, taking into consideration the utility, convenience and inconvenience, and expense which will result to individuals as well as to the public, if such road, or any part thereof, shall be established and opened or altered.

Said commissioners or viewers shall also assess and determine the amount of damages sustained by any person or persons through whose premises the said road is proposed to be established. Such commissioners or viewers shall not assess or award damages or compensation to any person or persons in consequence of the opening of said road, unless the owner or owners, or their agents, or guardians, having been duly notified as provided in this act of the applications and proceedings by which their property is sought to be appropriated or damaged, shall have filed a written application with said commissioners, giving a description of the premises on which damages or compensation are claimed, at the time of said view and hearing, as hereinbefore provided for: *Provided,* That in case any person has not received the notice of the view of said road, as hereinbefore provided for, he may at any time within twelve months after the location of said road file an application for damages with the county commissioners, who shall determine the amount of damages sustained by such claimant; and all applications for damages shall be forever barred unless they are presented as provided for in this act. If the commissioners or viewers, after viewing such proposed road, shall so direct, the county surveyor shall survey the said road under their direction, and cause the same to be conspicuously marked throughout, noting the courses and distances.

He shall also make out and deliver to the county clerk, without delay, a correct and certified return of the survey of the said road, and a plat of the same, and the said commissioners or viewers shall make out and sign a certificate stating their opinion in favor of or against the establishment, alteration or vacation of said road or any part thereof, and set forth the reason of the same, which certificate shall be filed with the county clerk on or before the first day of the session of the commissioners then next ensuing; and at such session next ensuing the said commissioners shall, if they conclude that said road should be established, al-

tered, or vacated, and no legal objections appear against the same, and they are satisfied that such road will be of public utility, enter an order upon their records that said road, survey and plat be recorded in the office of the county surveyor and from thence forth said road shall be considered a public highway, and the county surveyor shall issue his order to the trustees of the respective townships in which said road is located, directing them to cause the same to be opened for the public travel at the time and in the manner indicated by him; but if the commissioners conclude that such road as applied for is unnecessary or impracticable, then no further proceedings shall be had thereon and the obligor or obligors on the bond securing costs shall be liable for the full amount of all costs accrued by reason of the view of said road.

History: L. 1911, ch. 248, § 6; May 22; R.S. 1923, 68-106.

Source or prior law:

L. 1864, ch. 112, § 5; G.S. 1868, ch. 89, § 6; L. 1874, ch. 108, §§ 5, 6; L. 1903, ch. 411, § 2.

Cross References to Related Sections:

Acquisition of real property for highway road or street purposes, see 58-3501 to 58-3506.

Research and Practice Aids:

Highways⇐41(2), 72(1).
C.J.S. Highways §§ 62, 100 et seq.

CASE ANNOTATIONS

Annotations to L. 1903, ch. 411, § 2:

1. Recital in report that claim presented; want of notice cured. Howard v. Schmidt, 70 K. 640, 79 P. 142.

2. Recital in report of viewers may be contradicted. Howard v. Schmidt, 70 K. 640, 79 P. 142.

3. Omission of survey where report shows location not attacked collaterally. Molyneux v. Grimes, 78 K. 830, 98 P. 278.

4. Commissioners may establish road notwithstanding adverse report of viewers. Molyneux v. Grimes, 78 K. 830, 98 P. 278.

5. Board may act on report at adjourned session of meeting. Molyneux v. Grimes, 78 K. 830, 98 P. 278.

6. Landowner appealing from allowance of claim estopped from obtaining injunction. Wilson v. Cloud County, 90 K. 107, 132 P. 1176.

7. Nonresident owner has twelve months to file claim for damages. Guthrie v. Atchison County, 94 K. 584, 588, 146 P. 1157.

Annotations to L. 1911, ch. 248, § 6:

8. Commissioners may relocate road even though viewers report adversely. Lockard v. Saline County, 93 K. 742, 145 P. 900.

9. Order not void where petitioners required to pay portion of damages. Lockard v. Saline County, 93 K. 742, 145 P. 900.

10. Report of viewers, survey and plat recorded; road prima facie established. Gehlenberg v. Saline County, 100 K. 487, 493, 165 P. 286.

11. Discrepancies in road record; not fatal; road lawfully opened. Gehlenberg v. Saline County, 100 K. 487, 493, 165 P. 286.

Annotations to R.S. 1923, 68-106:

12. Claims for damages may be considered and determined when road opened. Haucke v. Morris County, 115 K. 659, 660, 224 P. 64; Mathewson *et al.*, v. City of Wichita, 117 K. 455, 457, 232 P. 233.

13. Description of premises on which damages or compensation claimed must be stated. Flemming v. Ellsworth County Comm'rs, 119 K. 598, 600, 240 P. 591.

14. County commissioners act judicially in determining legal objection to vacating road. Heatherman v. Kingman County Comm'rs, 123 K. 77, 254 P. 321.

15. Section held not to bar reconsideration of board's action at same session. State, *ex rel.*, v. Jefferson County Comm'rs, 135 K. 7, 8, 11, 9 P.2d 637.

16. Separate tracts with different owners operated as a unit; computation of damages. McIntyre v. Board of County Comm'rs of Doniphan County, 168 K. 115, 118, 211 P.2d 59.

17. Mentioned in determining condemnation proceeding pursuant to 68-703; deposit of award with county clerks; withdrawal; interest. Barker v. County of Wyandotte, 188 K. 750, 753, 755, 366 P.2d 291.

18. Cited; review of certain statutes applicable to township roads. Clay Township v. Pebley, 207 K. 59, 61, 483 P.2d 1101.

68-107. Separate certificates of damages assessed; appeal from award; benefit district assessment in counties between 30,000 and 90,000; notice and hearing; appeal. It shall be the duty of the commissioners or viewers, at the same time that they make their certificate of the view, if favorable, to make also a separate certificate, in writing stating the amount of damage, if any, by them assessed, and to whom, and submit therewith the written application upon which the assessments have been made.

Any person feeling aggrieved by the award of damages made by the board of county commissioners may appeal from the decisions of said board of county commissioners to the district court pursuant to K.S.A. 60-2101. In all counties having a population of not less than thirty thousand (30,000) and not more than ninety thousand (90,000) inhabitants, if the commissioners or viewers shall find that damages are sustained by owners of the land through which such road is located or opened, and if they find that certain special benefits are derived by the land in the vicinity of the road as well as by the public or the county at large, then they shall fix the limits of the benefit district

embracing such real estate as they find to be specially benefited and assess a part of the damages allowed against such benefit district. Such certificate of commissioners or viewers shall contain the correct description of each piece or parcel of private property taken, if any, and the value thereof, and of each piece of property damaged, and the amount of damages thereto for which compensation is to be paid as ascertained by the viewers or commissioners as above provided. Such benefit district shall extend back not less than one hundred feet and not more than twelve hundred feet from either side of the proposed road. If the land on either side of said proposed road be platted into lots or blocks, then the benefit district as to such platted land shall not extend more than one-half (½) block with a maximum distance of three hundred (300) feet on the side or sides of the road where such land is so platted. The commissioners or viewers shall proceed to assess benefits equal to the amount of damages in the following manner:

(1) Such an amount as they find shall be paid by the county.

(2) The remainder of the damages shall be assessed against the land in the benefit district as established, in the manner provided by this section in such amounts and in such proportions against the various tracts of land exclusive of improvements as they find such tracts of lands are benefited by the opening or location of such road. It shall be the duty of the commissioners or viewers at the same time that they make their certificate of review, if favorable, to make also a separate certificate in writing stating the amount of the damages, if any, by them assessed and to whom, and submit therewith the written application upon which the assessments have been made and at the same time submit a certificate showing the manner in which the damages are to be paid by the levying of benefits against the various tracts of land within the benefit district, which has been by them established in connection with and as a part of such proceedings and the manner of payment of such benefits.

In case a part of a tract of land is taken from which damages are allowed and benefits assessed against the remaining portion of such tract, then such part of the damages as may be necessary shall be applied to pay off and have discharged of record any taxes or mortgages on such condemned land and the owner of said land may have the remainder of the damages, if any, offset against the benefits assessed against such owner's remaining land in the benefit district, or so much thereof as may be required to pay such benefits in full. Benefits assessed may be paid in full without interest within thirty (30) days from date of final determination of the amount thereof. If not paid within such period of time, then they may be paid in the same manner as are general taxes, except that they shall be due in equal amounts over not to exceed five (5) years and the unpaid portions thereof shall bear interest at not to exceed six percent per annum, payable annually, which manner of payment and rate of interest shall be fixed by the board of county commissioners.

The net amount of damage to be paid to acquire such land so condemned shall be advanced by the county from its general fund and it shall thereafter receive and collect benefits in the manner provided for above and place the same with interest thereon to the credit of its general fund. The county commissioners shall thereupon set a day for a hearing in connection with the establishment of the benefit district and the fixing of damages and benefits, which date of hearing shall be not less than three weeks subsequent to the date of the fixing of such damages and benefits. It shall thereupon be the duty of the county clerk to insert in the official county paper an appropriate notice of the time, place and purpose of such hearing, which notice shall appear in such official county paper at least twice and the date of the last notice shall be at least three days before the date set for the hearing. The county clerk shall also mail to the owner of each tract of land, for which damages have been allowed, or against which benefits have been assessed, a copy of the proceedings, insofar as the fixing of the benefit district and of damages and benefits is concerned, and which notice shall also set forth the time and place and purpose of the hearing. This notice shall be mailed at least five days before the date of the hearing to all owners of the land taken or within the benefit district, as shown by the records in the office of the county treasurer, at the last address given at the time of the payment of the taxes. Failure to receive said notice

shall not affect the validity of any of these proceedings. Copies of said notice with an affidavit or affidavits of service attached shall be filed in the county clerk's office before the date of the final hearing. Upon the date provided for above there shall be a final hearing before the county commissioners or viewers, at which time said findings contained in said certificate of view shall be considered and a final order entered in the record of the county commissioners, which may amend, modify, approve or disapprove the findings contained in the certificate of the commissioners or viewers.

Any person feeling aggrieved by the orders made by the board of county commissioners or viewers, may appeal from the decision of said board of county commissioners or viewers to the district court pursuant to K.S.A. 60-2101. If no appeal to the district court is taken within the time prescribed by K.S.A. 60-2101, the assessment shall become final.

History: L. 1911, ch. 248, § 7; R.S. 1923, 68-107; L. 1933, ch. 234, § 1; L. 1941, ch. 307, § 1; L. 1945, ch. 266, § 1; L. 1951, ch. 374, § 2; L. 1977, ch. 105, § 21; July 1.

Source or prior law:

L. 1864, ch. 112, § 7; G.S. 1868, ch. 89, § 7; L. 1874, ch. 108, § 7; L. 1903, ch. 411, § 4.

Research and Practice Aids:

Highways⇐72(7).
C.J.S. Highways § 109.

CASE ANNOTATIONS

Annotations to L. 1903, ch. 411, § 4:

1. Appeal from report cannot be taken under 19-1426. Willis v. Stafford, 84 K. 570, 114 P. 854.

2. Party awarded damages and not appealing cannot maintain injunction. Willis v. Stafford, 84 K. 570, 572, 114 P. 854.

3. Parts of statutes omitted in amendments ordinarily considered as annulled. Hauserman v. Clay County, 89 K. 555, 557, 132 P. 212.

4. Commissioners cannot revise allowance made by viewers; appeal from allowance. Hauserman v. Clay County, 89 K. 555, 557, 132 P. 212.

Annotations to L. 1911, ch. 248, § 7 and amendments:

5. Claim for damages disallowed by commissioners; remedy by appeal only. Meehan v. Barber County, 108 K. 251, 252, 194 P. 916.

6. Appeal taken to district court if award made not satisfactory. Haucke v. Morris County, 115 K. 659, 660, 224 P. 64; Mathewson *et al.*, v. City of Wichita, 117 K. 455, 457, 232 P. 233.

7. Damages cannot be adjusted or allowed other than prescribed by statute. Haucke v. Morris County, 115 K. 659, 660, 224 P. 64.

8. Appeal properly prosecuted in name of real party in interest. May, *Agent*, v. Riley County, 117 K. 57, 59, 230 P. 74.

9. Section cited in considering right to damages for premises not described. Flemming v. Ellsworth County Comm'rs, 119 K. 598, 601, 240 P. 591.

10. Procedure on appeal to district court discussed. Durkee v. Bourbon County Comm'rs, 142 K. 690, 691, 51 P.2d 984.

11. Appeal bond for $100 held void and district court without jurisdiction. *In re* Fredelake, 148 K. 432, 433, 82 P.2d 1090.

12. Appeal bond not conforming to 61-1002 held void; appeal dismissed. Grigsby v. Coyle, 165 K. 445, 447, 448, 196 P.2d 181.

13. Condemnation award under 68-114; appeal dismissed; duty to pay award. Larkin v. Nemaha County Comm'rs, 170 K. 164, 169, 170, 223 P.2d 987.

14. Mentioned in determining condemnation proceeding pursuant to 68-703; deposit of award with county clerk; withdrawal; interest. Barker v. County of Wyandotte, 188 K. 750, 753, 755, 366 P.2d 291.

15. Cited; review of certain statutes applicable to township roads. Clay Township v. Pebley, 207 K. 59, 61, 62, 63, 483 P.2d 1101.

68-108. Place of beginning or true course of road uncertain; resurvey; recordation. When the place of beginning or true course of any road shall be uncertain by reason of the removal of any monument or marked tree by which the road was originally designated, or from any other cause, the county commissioners shall constitute a board of review, or the county commissioners may appoint three disinterested householders of the county as a board of review, and the commissioners or such other review board may re-view, re-mark and straighten said road, if they deem it necessary; and after establishing the place of beginning or true course of the road, the board of commissioners shall notify the county surveyor, who shall view and re-survey the same, and shall have the same correctly marked, as in the case of a new road, and shall make a correct return of said survey and a plat of said road; and the same, together with the certificate of the commissioners or viewers, shall be recorded as in other cases, and from thenceforth said road, surveyed as aforesaid, shall be considered a public highway. In resurveying any such road the existing landmarks may be supplemented with such other data, monuments, and witnesses as are available.

History: L. 1911, ch. 248, § 8; R.S. 1923, 68-108; L. 1961, ch. 299, § 2; June 30.

Source or prior law:

L. 1864, ch. 112, § 8; G.S. 1868, ch. 89, § 8; L. 1872, ch. 175, § 4; L. 1874, ch. 108, § 8; L. 1903, ch. 411, § 5.

CASE ANNOTATIONS

1. Cited in mandamus action to compel maintenance of road along its true course by county commissioners.

Volume2

Appendix 9—Matrix of Disposition of Structures on SSC Properties

DISPOSITION OF STRUCTURES ON SSC PROPERTIES

1	2	3	4	5	6	7	8	9	10	11
				STATUS						
Q TY TRACT ID	QU SE SEC TWN RG	BLDG TYPE	BLDGS OUTSIDE FEE AREA	REMOVE	POSSIBLE FUTURE USES					
					CONSTRUCTION PHASE			DURING CONSTRUCTION PHASE		
					CONSTR. OFF.	SECURITY OFF.	STOR. OF EQ. & MAT.	STAFF HOUSE	SECURITY OFF.	STOR. OF MAINT EQ. & MATER.
1 F P 1	S, NW 15 T15S R15E	HR	X							
		O	X							
1 F P 1	, NW 22 T14S R16E	HR	X							
		O	X							
1 C 3	SE 28 T14S R16E	HR		X						
1 C 7	N, SE 27 T14S R16E	HR			X	X		X	X	
		O								X
1 C 9	S, SE 27 T14S R16E	O					X			X
1 C 10	, NE 33 T14S R16E	HR		X						
		O		X						
1 C 11	, S 33 T14S R16E	HR			X	X		X	X	
		O					X			X

LEGEND

Q - Quadrant
TY - indicates the use of the area on the SSC ring in which the tract falls

QU-SE - Quarter Section
SEC - Section
TWN - Township
RG - Range

BLDG TYPE - Building Type
HR - House
O - Other (farm building, barn, etc.)

DISPOSITION OF STRUCTURES ON SSC PROPERTIES

1	2	3	4	5	6	7	8	9	10	11
				STATUS						
Q TY TRACT ID	QU SE SEC TWN RG	BLDG TYPE	BLDGS OUTSIDE FEE AREA	REMOVE	POSSIBLE FUTURE USES					
					CONSTRUCTION PHASE			DURING CONSTRUCTION PHASE		
					CONSTR. OFF.	SECURITY OFF.	STOR. OF EQ. & MAT.	STAFF HOUSE	SECURITY OFF.	STOR. OF MAINT EQ. & MATER.
1 C 12	NW 34 T14S R16E	HR			X	X		X	X	
		O					X			X
1 C A 13	NE,NE 34 T14S R16E	HR			X	X		X	X	
1 C 14	SE 34 T14S R16E	HR					X			X
1 C 15	SE,SE 34 T14S R16E	HR			X	X		X	X	
		O					X			X
1 CS A 16	SW 34 T14S R16E	HR			X	X		X	X	
		O					X			X
1 FE 24	N 25 T14S R16E	HR	X							
1 F 26	SE 25 T14S R16E	HR	X							
		O	X							

DISPOSITION OF STRUCTURES ON SSC PROPERTIES

1	2	3	4	5	6	7	8	9	10	11
				STATUS						
QUTY TRACT ID	QU SE SEC TWN RG	BLDG TYPE	BLDGS OUTSIDE FEE AREA	REMOVE	POSSIBLE FUTURE USES					
					CONSTRUCTION PHASE			DURING CONSTRUCTION PHASE		
					CONSTR. OFF.	SECURITY OFF.	STOR. OF EQ. & MAT.	STAFF HOUSE	SECURITY OFF.	STOR. OF MAINT EQ. & MATER.
1 CS A 27	SW,SW 35 T14S R16E	HR			X	X		X	X	
		O								X
1 FE 30	SW 30 T14S R17E	HR	X							
1 FE 33	N, SW 29 T14S R17E	HR	X							
		O	X							
1 FE 39	SE 29 T14S 417E	HR	X							
		O	X							
1 FE 54	N, NE 32 T14S R17E	HR						X	X	
1 FE 56	NW 33 T14S R17E	HR	X							
		O	X							
1 FE 57	NE 33 T14S R17E	HR	X							

DISPOSITION OF STRUCTURES ON BLM PROPERTIES

1	2	3	4	5	6	7	8	9	10	11
				STATUS						
Q TY TRACT ID	QU SE SEC TWN RG	BLDG TYPE	BLDGS OUTSIDE FEE AREA	REMOVE	POSSIBLE FUTURE USES					
					CONSTRUCTION PHASE			DURING CONSTRUCTION PHASE		
					CONSTR. OFF.	SECURITY OFF.	STOR. OF EQ. & MAT.	STAFF HOUSE	SECURITY OFF.	STOR. OF MAINT EQ. & MATER.
1 FE 67	N, NW 11 T15S R17E	HR	X							
		O	X							
1 FE 91	E, SE 36 T15S R17E	HR	NOT FOUN							
2 FE 8	N 13 T16S R17E	HR	X							
		O	X							
2 FE 16	N, SE 26 T16S R17E	HR	X							
		O	X							
2 F 39	SW 6 T17S R17E	HR	X							
2 F 40	NW 7 T17S R17E	O					X			X
3 F 1	NW 10 T17S R16E	HR			X	X		X	X	
		O					X			X

DISPOSITION OF STRUCTURES ON GSC PROPERTIES

1	2	3	4	5	6	7	8	9	10	11
				STATUS						
Q TY TRACT ID	QU SE SEC TWN RG	BLDG TYPE	BLDGS OUTSIDE FEE AREA	REMOVE	POSSIBLE FUTURE USES					
					CONSTRUCTION PHASE			DURING CONSTRUCTION PHASE		
					CONSTR. OFF.	SECURITY OFF.	STOR. OF EQ. & MAT.	STAFF HOUSE	SECURITY OFF.	STOR. OF MAINT EQ. & MATER.
3 F 5	NE 8 T17S R16E	HR			X	X		X	X	
		O					X			X
3 F 8	N, NW 8 T17S R16E	HR	X							
3 F 10	E 8 T17S R16E	O	X							
3 F 11	NW 8 T17S R16E	HR			X	X		X	X	
		O					X			X
3 F 12	NW 8 T17S R16E	O					X			
3 F 15	SE 1 T17S R15E	O		X						
3 F 16	NE 12 T17S R15E	O					X			
3 F 18	SW 1 T17S R15E	O	X							
3 F 20	E, SE 2 T17S R15E	HR	X							
		O	X							

D. DISPOSITION OF STRUCTURES ON SFC PROPERTIES

1	2	3	4	5	6	7	8	9	10	11
				STATUS						
Q TY TRACT ID	QU SE SEC TWN RG	BLDG TYPE	BLDGS OUTSIDE FEE AREA	REMOVE	POSSIBLE FUTURE USES					
					CONSTRUCTION PHASE			DURING CONSTRUCTION PHASE		
					CONSTR. OFF.	SECURITY OFF.	STOR. OF EQ. & MAT.	STAFF HOUSE	SECURITY OFF.	STOR. OF MAINT EQ. & MATER.
3 FE 27	E 3 T17S R15E	HR	X							
		O	X							
3 FE 43	W, SE 29 T16S R15E	HR	X							
		O	X							
3 FE 56	N 18 T16S R15E	HR	X							
		O	X							
4 F P 1	N&SW 23 T14S R15E	HR			X	X			X	
4 F P 4	W, SE 23 T14S R15E	HR			X	X			X	
		O					X			
4 F P 9	SE 25 T14S R15E	HR			X	X			X	
		O					X			X

DISPOSITION OF STRUCTURES ON SSC PROPERTY

1	2	3	4	5	6	7	8	9	10	11
				STATUS						
Q TY TRACT ID	QU SE SEC TWN RG	BLDG TYPE	BLDGS OUTSIDE FEE AREA	REMOVE	POSSIBLE FUTURE USES					
					CONSTRUCTION PHASE			DURING CONSTRUCTION PHASE		
					CONSTR. OFF.	SECURITY OFF.	STOR. OF EQ. & MAT.	STAFF HOUSE	SECURITY OFF.	STOR. OF MAINT EQ. & MATER.
4 FE 32	S, SE 33 T14S R15E	HR			X	X		X	X	
		O					X			X
4 FE 35	SE 33 T14S R15E	HR			X	X		X	X	
		O					X			X
4 FE 39	N 28 T14S R15E	HR			X	X			X	
4 F 57	NW 34 T14S R15E	HR			X	X			X	
		O					X			X
4 FE 53	W 26 T14S R15E	HR	X							
		O	X							
4 F 60	SW 26 T14S R15E	HR			X	X		X	X	
		O					X			X
4 F 66	W, SE 26 T14S R15E	HR			X	X		X	X	

DISPOSITION OF STRUCTURES ON SSC PILOT SITE

1	2	3	4	5	6	7	8	9	10	11
				STATUS						
Q TY TRACT ID	QU SE SEC TWN RG	BLDG TYPE	BLDGS OUTSIDE FEE AREA	REMOVE	POSSIBLE FUTURE USES					
					CONSTRUCTION PHASE			DURING CONSTRUCTION PHASE		
					CONSTR. OFF.	SECURITY OFF.	STOR. OF EQ. & MAT.	STAFF HOUSE	SECURITY OFF.	STOR. OF MAINT EQ. & MATER.
4 F A 66	SE 26 T14S R15E	HR			X	X		X	X	
4 F 69	SW 25 T14S R15E	HR			X	X		X	X	
		O					X			X
4 FE 70	NE 25 T14S R15E	HR			X	X		X	X	
		O					X			X
4 F 73	SE 25 T14S R15E	HR			X	X		X	X	
4 F 74	SE 25 T14S R15E	HR			X	X		X	X	
4 FE 78	NE,SE 25 T14S R15E	HR			X	X		X	X	
4 F 79	E 25 T14S R15E	HR		X						
4 F 85	SE,NE 30 T14S R16E	HR			X	X		X	X	
4 F 88	SE 30 T14S R16	HR		X						
		O		X						

DISPOSITION OF STRUCTURES ON SEV PROPERTIES

1	2	3	4	5	6	7	8	9	10	11
				STATUS						
Q TY TRACT ID	QU SE SEC TWN RG	BLDG TYPE	BLDGS OUTSIDE FEE AREA	REMOVE	POSSIBLE FUTURE USES					
					CONSTRUCTION PHASE			DURING CONSTRUCTION PHASE		
					CONSTR. OFF.	SECURITY OFF.	STOR. OF EQ. & MAT.	STAFF HOUSE	SECURITY OFF.	STOR. OF MAINT EQ. & MATER.
4 C 90	NE,NE 31 T14S R16E	O		X						
4 C 92	NW,SE 31 T14S R16E									
4 C 93	SE 31 T14S R16	HR			X	X		X	X	
		O		X						
4 C 97	SW 29 T14S R16	HR			X	X		X	X	
		O								X
4 C 98	N 32 T14S R16E	HR			X	X		X	X	
		O					X			X
4 C A 98	NW,NW 32 T14S R16E	O								
4 FE 100	W, NE 29 T14S R16E	HR			X	X		X	X	
4 NC A 100	W, NE 29 T14S R16E	HR			X	X		X	X	
		O					X			X

DISPOSITION OF STRUCTURES ON SSC PROPERTIES

1	2	3	4	5	6	7	8	9	10	11
				STATUS						
Q TY TRACT ID	QU SE SEC TWN RG	BLDG TYPE	BLDGS OUTSIDE FEE AREA	REMOVE	POSSIBLE FUTURE USES					
					CONSTRUCTION PHASE			DURING CONSTRUCTION PHASE		
					CONSTR. OFF.	SECURITY OFF.	STOR. OF EQ. & MAT.	STAFF HOUSE	SECURITY OFF.	STOR. OF MAINT EQ. & MATER.
4 C 105	SW 28 T14S R16E	HR		X						
		O		X						
4 C 108	NE 33 T14S R16E	HR		X						

SUMMARY

Number of tracts outside fee area - 21
Number of tracts with buildings to be removed - 9
Number of tracts with building which may be used as construction/secturity offices - 32
Number of tracts with buildings which may be used as staff housing - 27
Number of tracts with buildings which may be used as storage facilities - 25

See Figure 6.6 (Location of Structures Eligible for Relocation Assistance and/or Potential SSC Use) for tract locations on the proposed Kansas SSC site.

Site Proposal for the Superconducting Super Collider

Kansas

Volume 3

Geology and Tunneling

For more information, contact:

SSC Project Office
Kansas Department of Commerce
400 W. 8th, Suite 500
Topeka, Kansas 66603
(913) 296-5272

Cover art from the original painting "*Explosion of Creation*" by Kansas artist Philomene Bennett

Cover design by Jennifer Sims, Kansas Geological Survey

Contents

3.1 GENERAL 1
3.1.1 Detailed Proposed Location 1
3.1.2 Proposed Vertical Profile 1
3.2 GEOLOGY 1
3.2.1 Regional Geologic Map and Stratigraphic Description 3
3.2.2 Geologic Profile of the Proposed Tunnel and Other Underground Facilities 3
3.2.3 Detailed Surface Geology Map and Description of Stratigraphic Units 4
3.2.4 Geologic Features of the Proposed Site Which May Require Special Consideration in Design, Construction, and Operation 13
3.2.5 Soft Clays, Unconsolidated Sands, or Other Soil Conditions 14
3.2.6 Location of Data Sources 15
3.3 GEOHYDROLOGY 15
3.3.1 Geohydrological Regimes 15
3.3.2 Water Resources for the SSC Facility 18
3.3.3 Locations where Underground Construction May be Affected by Ground Water 20
3.4 SEISMICITY AND FAULTING 24
3.4.1 Characterization of Site Seismicity 24
3.5 TUNNELING AND UNDERGROUND CONSTRUCTION 27
3.5.1 Relevant Soil and Rock Units 27
3.5.2 Physical and Mechanical Properties of the Units Likely to be Utilized or Excavated 27
3.5.3 Advantages and Difficulties Presented by Site Geologic Units 29
3.5.4 Recommended Construction Techniques 29
3.5.5 Disposal of Spoils from Tunneling and Other Construction 43

Tables

3.1—Permeabilities of bedrock within a 5-mile radius of Wolf Creek Generating Station 21
3.2—Analysis of water from typical wells, test holes, and springs in SSC area 23
3.3—Unconfined compressive strength of bedrock units reported from projects near the site 28
3.4—Bedrock test data, Clinton Dam project 30
3.5—Pomona Dam project, dam site average test results 31
3.6—Results of unconfined compression tests on rock core samples, Wolf Creek Generating Station project 32
3.7—Bedrock test data, Melvern Dam project 35
3.8—Bulk densities of selected rock samples at Wolf Creek Generating Station 36
3.9—Results of swelling pressure tests on shale at Wolf Creek Generating Station project 38
3.10—Results of clay mineralogy and slaking tests on shale samples at Wolf Creek Generating Station 40
3.11—Field permeability test results, ultimate heat sink, Wolf Creek Generating Station project 41
3.12—Tunnel spoil storage for SSC 44

Figures

3.1—Proposed Kansas SSC site showing relationship to existing infrastructure and metropolitan areas 2
3.2—Conceptual SSC site and infrastructure map 3
3.3—Block diagram of cuesta topography, vertically exaggerated for Kansas 4
3.4—Location of the proposed Kansas SSC site at national, regional, and subregional scale 5
3.5—Generalized stratigraphic section of geologic units at or in the vicinity of the proposed Kansas SSC site 9
3.6—Major structural geology features in Kansas 11
3.7—Ground-water regions and representative water-quality sites in the SSC area 16
3.8—Potentiometric-surface map of the Douglas Group aquifers 19
3.9—Stiff diagrams showing representative well-water qualities for aquifers in the SSC site area 22
3.10—Midcontinent portion of the U. S. Geological Survey Earthquake Risk Map of the United States 24

Figures, continued

3.11—Trends of earthquake activity recorded by the Kansas Geological Survey's regional seismic network since its installation in late 1977 25
3.12—Locations and MM intensities of earthquakes in the region during the period of historical record, 1867-1987 26
3.13—Locations and identifications of stations in the Kansas Geological Survey's seismic network 27
3.14—Spoils disposal, alternative 1, enclosed stone quarry 46
3.15—Spoils disposal, alternative 2, enclosed stone quarry 46
3.16—Spoils disposal, alternative 3, enclosed stone quarry 46
3.17—Spoils disposal, alternative 4, enclosed stone quarry 46
3.18—Spoils disposal, alternative 5, stone quarry 47
3.19—Spoils disposal, alternative 6, stone quarry 47
3.20—Spoils disposal, alternative 7, stone quarry 47
3.21—Spoils disposal, alternative 8, stone quarry 48
3.22—Spoils disposal, alternative 9, abandoned mine pit 48
3.23—Spoils disposal, alternative 10, abandoned mine pit 48
3.24—Proposed disposal sites and haul roads 49

Plates

3.1--Proposedlocation of collider ring and SSC facilities on topographic map at 1:24,000 scale
3.2--Generalized geologic map of proposed site area
3.3 (north)--Detailed tunnel profile in relation to geology of north half of collider ring at 1:24,000 scale
3.3 (south)--Detailed tunnel profile in relation to geology of south half of collider ring at 1:24,000 scale
3.4 (north)--Detailed surface geology map of north half of collider ring area at 1:24,000 scale
3.4 (south)--Detailed surface geology map of south half of collider ring area at 1:24,000 scale
3.5--Structural contour map of the top of the Lawrence Formation

Appendix

1--Properties of Soils in the Vicinity of the Proposed SSC Project

Volume 3—Geology and Tunneling

3.1 GENERAL

The proposed Kansas location of the SSC oval is shown in Figure 3.1, a sketch illustrating the regional relationship of the site to major necessary related infrastructure and nearby cities and metropolitan areas. Note that the collider oval is oriented with its long axis east-west with the campus and injector facilities located on the north side.

The site south of Topeka was chosen and described in a preliminary suitability assessment of numerous areas in the state, prepared by the staff of the Kansas Geological Survey (Wilson and others, March 24, 1986). This location contains, or was close to, all necessary and desirable site elements, such as electrical power, water, transportation and supply facilities, and proximity to major metropolitan areas and research universities, which were outlined by the U.S. Department of Energy (DOE) in preliminary SSC siting-parameters documents.

Our preliminary screening study was done prior to, and without knowledge of, the more detailed conceptual Site Design Documents (SSC-SR-2020 and attachments) prepared for DOE by the Central Design Group (CDG) and released at the same time as our preliminary report in late-March 1986. The Kansas site matches almost exactly the physical layout and scale of the general or conceptual site area sketched by the CDG (Figure 3.2). The terrain, geologic setting, and proposed machine-boring and tunnel-lining methods described in the Kansas Geological Survey's preliminary assessment matched those described by DOE's consultants for its conceptual soft-ground (actually soft-rock) site example A. From the detailed descriptions which follow, the proposed Kansas site clearly meets or exceeds all of the technical and other criteria outlined by the CDG in its conceptual-design documents and in DOE's April 1987 Invitation for Site Proposals (ISP).

3.1.1 Detailed Proposed Location

Plate 3.1 (in map tube) is a topographic map showing the plan-view location of the collider and surface facilities at 1:24,000 scale. Generalized surface geology of the area is shown in Plate 3.2 (in map tube) and is discussed in Section 3.2.1. Proposed minor relocations of shafts F4, F6, E9, and J3 and the reasons for those changes are discussed in Section 6.1.1.

3.1.2 Proposed Vertical Profile

Detailed tunnel profiles in relation to the geology are illustrated at 1:24,000 scale on Plates 3.3 (north) and 3.3 (south) (in map tube) A detailed discussion of the geological and geotechnical considerations that determined the optimum vertical orientation of the plane of the collider is included in Section 3.2.2.

3.2 GEOLOGY

The site is located near the northern boundary of the Osage Cuestas physiographic region of Kansas (Schoewe, 1949), a subdivision of the Central Lowlands Province of the Interior Plains Division of the United States (Fenneman, 1946). The terrain is developed on an alternating series of limestone and shale formations that dip gently away from the Ozark Plateau in southwestern Missouri. In eastern Kansas, including the site area, the rock strata are inclined downward to the west-northwest (WNW) at about 20-25 feet over a horizontal distance of a mile (about a quarter of a degree). The land surface, on the other hand, slopes from the crest of the Flint Hills divide, which is just beyond the western edge of the site region, downward to the east-southeast (ESE) at an average rate of about 4 feet per mile. The resulting effect is that successively younger geologic rock units crop out from east to west in stripes of varying widths arranged in slightly curved arcs concentric to the Ozark dome. In the site area, the outcrop bands trend approximately north-northeast-south-southwest.

The limestone units are more resistant to erosion than the shale formations and their outcrops form a series of low, linear ridges parallel to the outcrop trend. The shales, which alternate in a repetitive sequence with the limestones, are thicker, softer, and less resistant to erosion. They form upward-steepening, concave slopes below the capping limestone outcrops but flatten to nearly horizontal near the lower contact with the next underlying limestone unit. In vertical cross section, this sequence resembles a collapsed staircase with the limestones forming the treads and the thicker shales the risers between steps. Viewed obliquely from above, the landscape appears as a series of westward-inclined terraces with steeper east-facing slopes and broader, very gently inclined, western slopes.

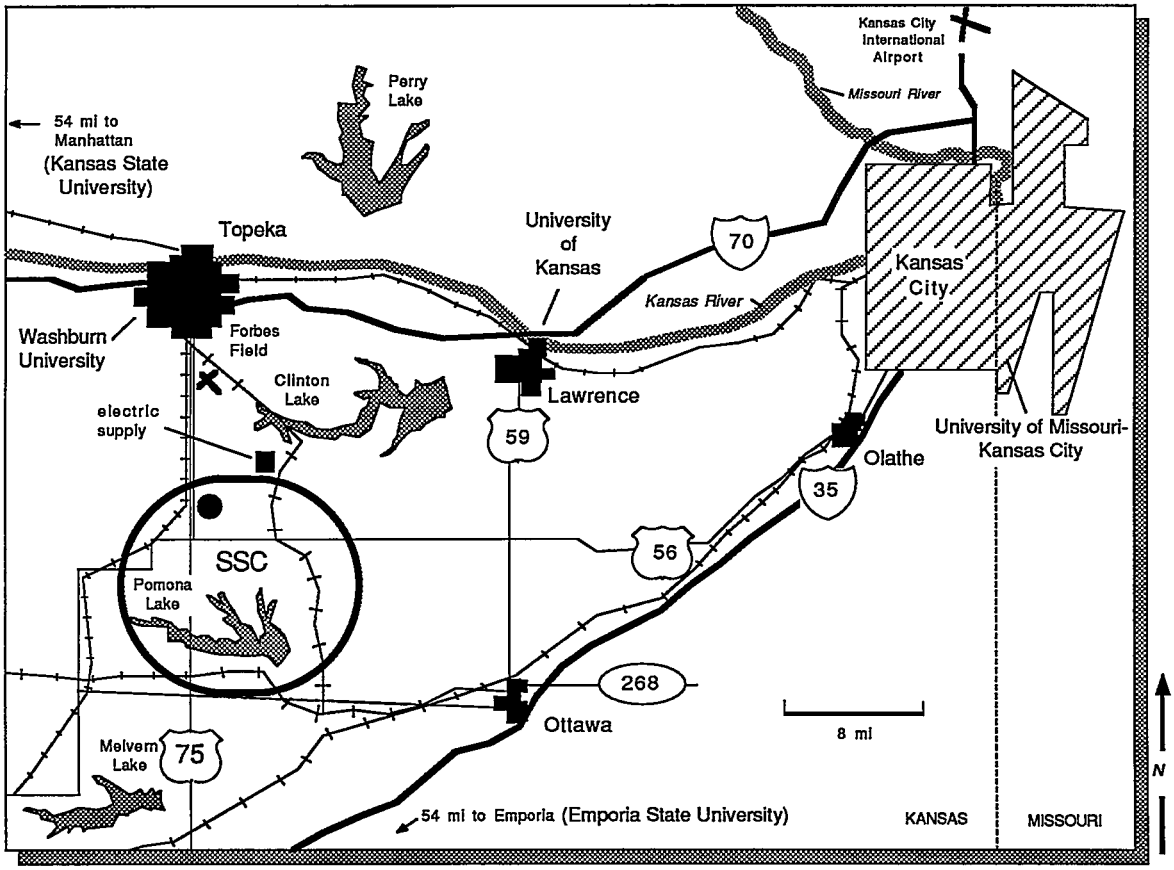


FIGURE 3.1—PROPOSED KANSAS SSC SITE SHOWING RELATIONSHIP TO EXISTING INFRASTRUCTURE AND METROPOLITAN AREAS.

Figure 3.3 is a vertically exaggerated, three-dimensional sketch of this landform, which is called a cuesta. The major regional streams tend to cut into the series of rock terraces at near right angles, scalloping the outcrop edges. Figure 3.4 is a realistic sketch of eastern Kansas illustrating its major physiographic or geomorphic features. The topography and geology of eastern Kansas is similar to the Appalachians or Ozarks, though more subdued because of the nearly flat-lying rock units on which it is formed. The average maximum topographic relief is about 300 feet from ridge tops to valley floors. Most of the major regional streams are artificially controlled near the cuesta faces by an extensive system of multi-purpose reservoirs; the tributaries and watersheds of the major streams contain hundreds of smaller farm ponds and recreational lakes.

This terrain is underlain by well-studied, stable, sedimentary-rock units laid down or deposited about 285 million years ago during the Pennsylvanian geologic period. As the name indicates, the beds are similar to, and of the same geologic age as, those in southwestern Pennsylvania, eastern Ohio, and West Virginia. The strata consist of cyclically deposited layers or formations of marine limestone averaging 50 to 75 feet in thickness which contain thinner interbedded shale units. Alternating with the limestone formations are thicker sequences of layers (averaging about 200 feet) predominantly composed of shale containing intermittent lenses or stringers of sandstone and a few thin coals and limestones. The mode of deposition is called cyclical because the limestone-shale sequence is repeated many times in a more-or-less predictable vertical succession caused by migration of shallow seas back and forth across gently sloping depositional surfaces during Pennsylvanian times. Both the limestone formations and the thicker shale formations are relatively uniform in thickness and physical composition across the entire region.

Because the strata are not complexly folded or faulted, their characteristics are predictable and correlatable along their outcrops and into the subsurface for considerable distances throughout the region and even across the state using records of numerous water, oil, gas, and other drill holes. This is a distinct and perhaps unique advantage of the Kansas site.

Not only is the geology relatively uniform and predictable, it is also well-studied. Even before Kansas became a state and continuing to the present time, the study of the geology of the area and its earth-related resources has been strongly supported for academic as well as economic reasons. Appointment of a State

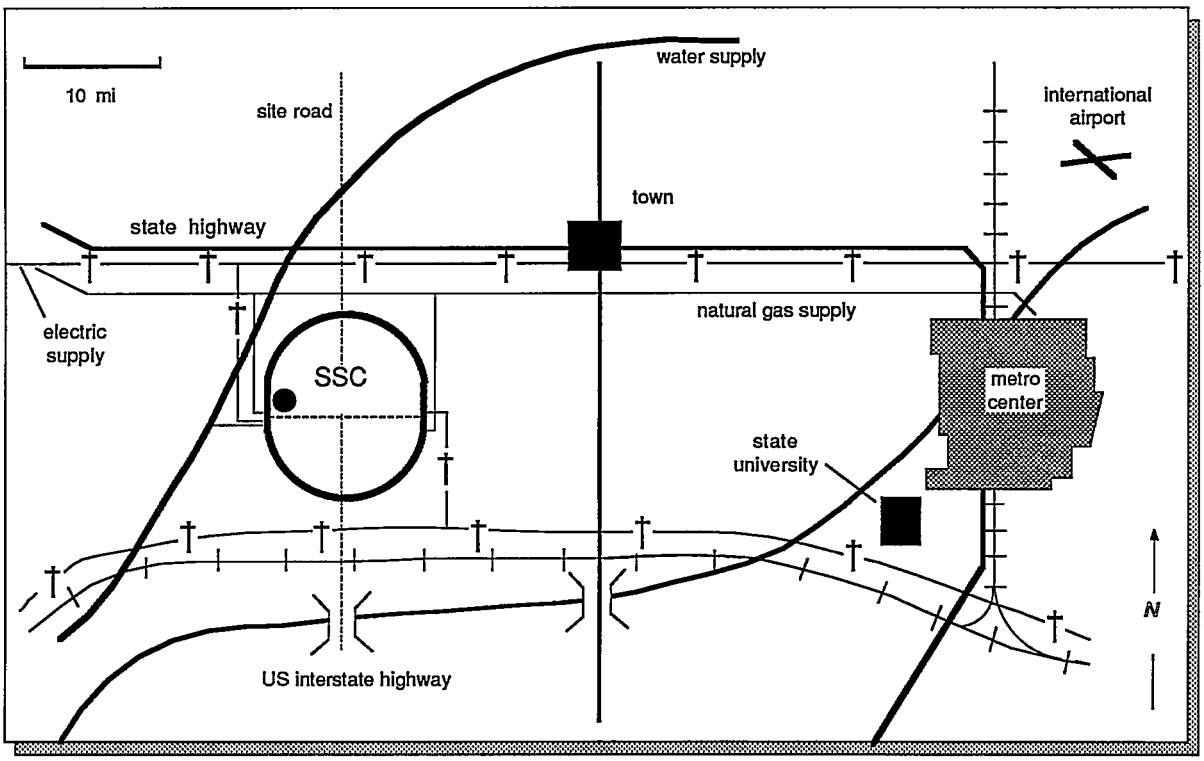


FIGURE 3.2--CONCEPTUAL SSC SITE AND INFRASTRUCTURE MAP (FROM SSC CONCEPTUAL DESIGN DOCUMENT, CONVENTIONAL FACILITIES, SSC-SR-2020C, MARCH 1987).

Geologist was among the early actions of the State Legislature in 1864, and with the continuing support of later legislatures and the cooperation of other government agencies, and oil, gas, minerals, ground-water, and related industries, the Kansas Geological Survey has maintained a high level of field work, mapping, research, publications, and record-keeping for more than a century. Because the region is near Lawrence, home of the University of Kansas and the Kansas Geological Survey, its geology has been closely studied.

The applied geology and geotechnical aspects of the strata are also well known as a result of the recent construction of a number of projects, including five large dams and a nuclear and two large coal-fired electrical generating plants with cooling lakes, as well as numerous interstate and other highways in the immediate area.

3.2.1 Regional Geologic Map and Stratigraphic Description

Plate 3.2 (in map tube) is a map of the surface geology of the region in, and adjacent to, the collider oval at 1:50,000 scale compiled from existing Kansas Geological Survey maps and sources. These were reports on Osage County (O'Connor, 1955), Douglas County (O'Connor, 1960), Franklin County (Ball and others, 1963), and Shawnee County (Johnson and Adkison, 1967). As described previously, the outcropping bedrock strata are of Upper Pennsylvanian geologic age and consist primarily of alternating limestones and shale with some sandstone and very minor amounts of coal.

The stratigraphy of these sedimentary rocks has been long studied in Kansas by the State Geological Survey and others. The result is an extremely detailed classification based on cycles of deposition which divides and subdivides the sequence of strata into groups, subgroups, formations, members, and beds. This level of detail is useful in stratigraphic studies, but because of the relative thinness of the limestone units, a limestone formation is usually combined with the overlying shale formation as a basis for county-scale or subregional mapping. This system was followed in preparing the map of the site area.

3.2.2 Geologic Profile of the Proposed Tunnel and Other Underground Facilities

Plates 3.3 (north) and 3.3 (south) (in map tube) illustrate the placement of the tunnel and shaft profiles in relation to the surface and subsurface geology.

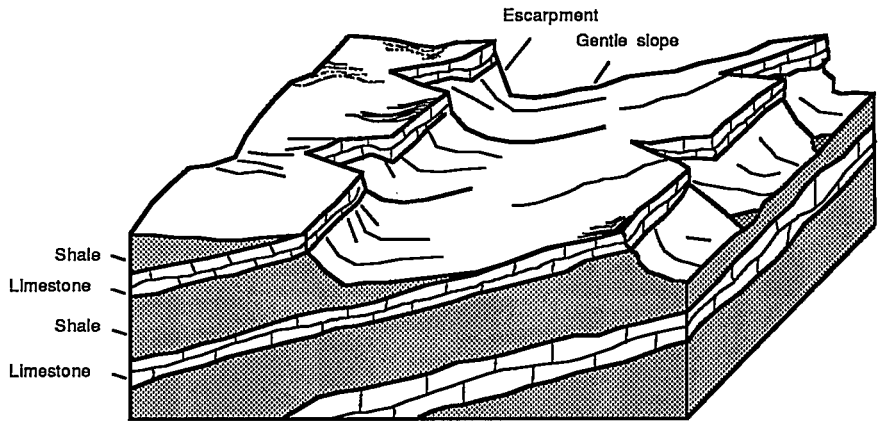


FIGURE 3.3—BLOCK DIAGRAM OF CUESTA TOPOGRAPHY, VERTICALLY EXAGGERATED FOR KANSAS.

Important considerations in the vertical underground placement of the main tunnel were the economic and practical advantages of excavating the tunnel in soft-rock geologic units, mainly competent shales, sandstones, and limestones, which have relatively uniform and predictable qualities. In addition to simplifying the design of the tunnel and lining, rapid excavation with minimum problems can be done with readily available tunnel-boring machines (TBMs) and existing methodologies. The oval was oriented with its long direction east-west to fit around Pomona Lake and to take best advantage of the east-west and north-south Kansas land-survey grid and road system. This was done to reduce the triangular or curved-boundary severed remnants of land that will be left after securing land parcels and rights-of-way and also to enable maximum use of existing roads for direct service and access to remote facilities around the oval.

The elevation of the horizontal plane of the collider oval was set by the desirability of keeping the top of the bored tunnel in firm unweathered shale about 10 feet below the estimated bottom of the saturated alluvial deposits in the valleys of Salt Creek and Hundred and Ten Mile Creek, in the southeast quadrant of the oval. This sets the horizontal plane of the oval (at the vertical centerline of the tunnel) at 865 feet above mean sea level. At this elevation the maximum depth of the centerline of the tunnel is 325 feet below the highest point at the ground surface on the profile and a minimum depth of 50 feet at the lowest point, which is the estimated bottom of the stream channel of Hundred and Ten Mile Creek. The average depth of the 20 vertical shafts to the collider plane is 220 feet.

Note that the LINAC, LEB, MEB, and HEB are located 80 feet vertically above the plane of the collider tunnel in a higher shale unit and separated from it by a sequence of limestones and shales. In addition to providing the necessary separation required for radiation shielding between the tunnels, placing most of the accelerator tunnel complex in an easily bored but stable shale at this level should reduce its construction time and cost.

Other orientations of the collider plane are possible and may be considered as alternatives. By tilting the oval to the west-northwest an eighth of a degree (7.5 minutes), its plane would apparently parallel the dip of the rocks and the tunnel would be in the upper part of the Lawrence Formation, with the advantage of providing a uniform tunneling medium for its entire length. The deepest part of the tunnel in the western quadrant would be about 500 feet below the surface, however, which would result in deeper shafts and increased cost. A second option involves tilting the plane upward 0.5 degree toward the west-northwest from the shallowest point, although this configuration does not greatly decrease the shaft depths to the collider plane in the interaction regions. Both of the tilted planes remain possible options. Folded and terrain-following planes were also considered. All but the horizontal configuration introduce complexities in alignment and construction, which we intuitively believe may cause unpredictable delays and cost overruns during construction. We did not do a comparative analysis of the various orientations.

3.2.3 Detailed Surface Geology Map and Description of Stratigraphic Units

The detailed surface-geology map of an area about a mile either side of the plan-view centerline of the collider oval (Plates 3.4 [north] and 3.4 [south], in map tube) was produced by the Kansas Geological Survey from interpretations of recent air-photography of the area.

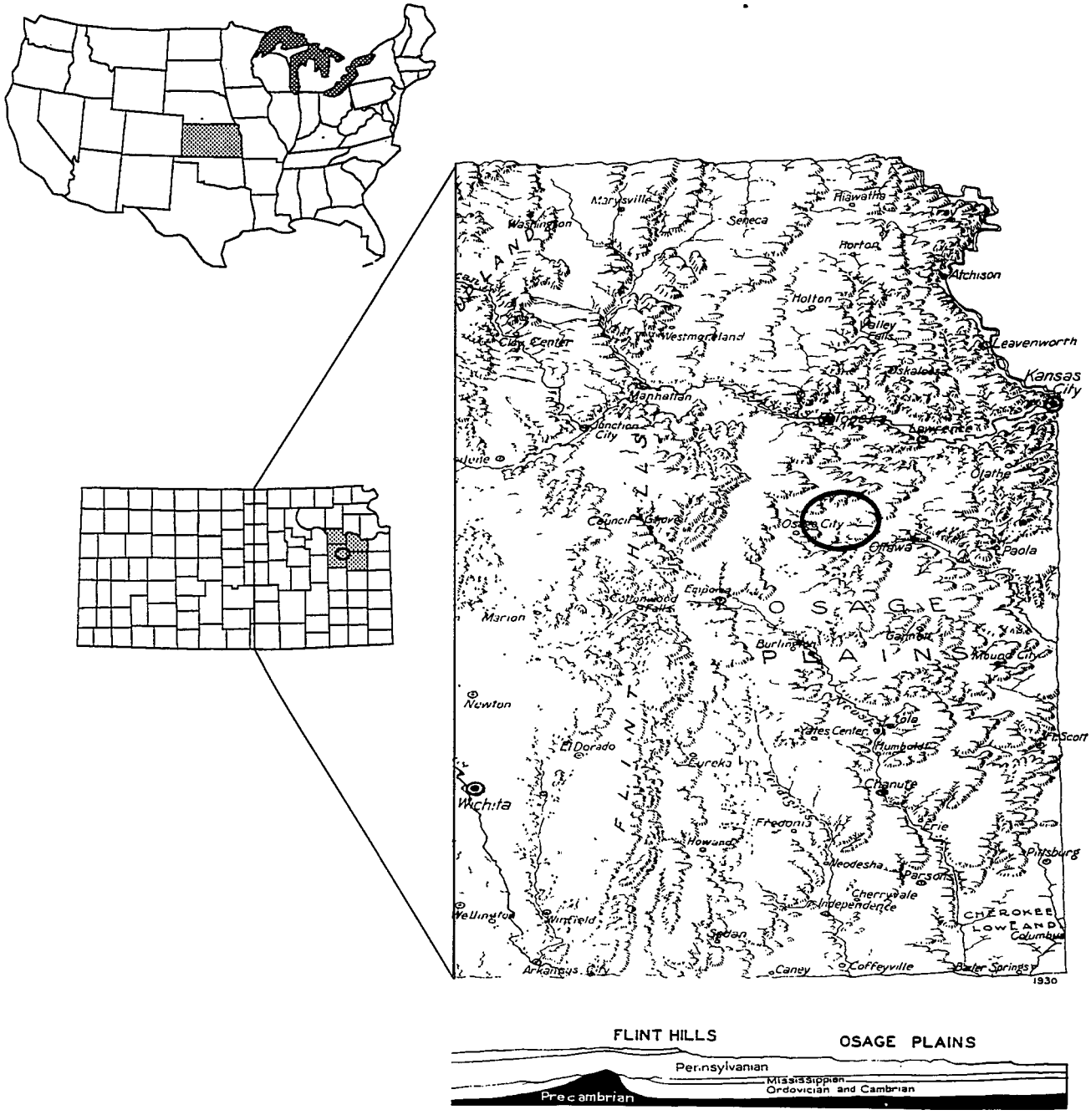


FIGURE 3.4--LOCATION OF THE PROPOSED KANSAS SSC SITE AT NATIONAL, REGIONAL, AND SUBREGIONAL SCALE.

Stratigraphy of the Region and Site

The following description of rock units is mainly geological; geotechnical aspects of the geology and soils are discussed in Section 3.5 following. The strata are described in order of deposition from oldest to youngest. The generalized stratigraphic section (Figure 3.5) can be used for reference.

Three geologic groups (Douglas, Shawnee, and Wabaunsee) crop out in the project area. The **Douglas Group** is geologically oldest and crops out at the lowest elevations, usually in hillslopes and along valley walls in the eastern part of the project area. The Douglas is divided into two formations.

The **Stranger Formation,** making up approximately the lower half, is principally shale with some sandstone. The basal **Weston Shale Member** has been cut out by erosion at the base of the Tonganoxie sandstone at the site but it occurs at the base of the Stranger south and north of the site and is overlain in a few areas by the

Iatan Limestone Member, which was discontinuously deposited. The **Tonganoxie Sandstone Member** is a deltaic stream deposit laid down in complexly meandering channels cut into and through various underlying layers. Its channels and bedding planes are complexly interwoven, and its base is uneven. Medium to coarse conglomerate sometimes occurs at the bottoms of the channels. Thickness of the Tonganoxie varies from 0 to 120 feet. Two discontinuous coal beds, the upper and lower **Sibley coals,** occur above the Tonganoxie sandstone and below the **Westphalia Limestone Member,** which is of variable thickness in the area and sometimes contains disrupted bedding caused by storm erosion before burial. Its thickness ranges from 0 to 13 feet but typically is about 2.5 feet. The **Vinland Shale Member** occurs at the top of the Stranger Formation and contains some sandstone or sandy shale in its lower part. Thickness is 6 to 45 feet but average is about 12 feet.

The **Lawrence Formation** comprises approximately the upper half of the Douglas Group. The **Haskell Limestone Member** occurs at the base of the Lawrence. It is a slabby, vertically jointed limestone ranging in thickness from 0 to 13 feet, but typically about 2 feet. The **Robbins Shale Member** overlies the Haskell and is of variable thickness ranging between 0 to 35 feet because of sandstone-filled channels cut into it by the overlying **Ireland Sandstone Member,** which is similar to the Tonganoxie sandstone described above. It ranges in thickness from 0 to 100 feet. The Amazonia Limestone Member is discontinuously present in the subsurface of the site area, appearing on a few of the oil- or water-well logs. Its thickness ranges from 0 to 6 feet but is typically 0.5 to about 2 feet. An **unnamed shale member** occupies the upper part of the Lawrence Formation. It is sandy in its lower part and contains a zone of red shale near its middle. Thickness is 5 to 40 feet. Two thin coal beds, the upper and lower **Williamsburg coals,** occur just below the top of the Lawrence Formation at some locations. The coals were mined in shallow underground drifts mainly along valley walls east of the proposed SSC site. Mining was not extensive and was done mainly by local landowners to produce coal for their own use. The upper Williamsburg coal ranges from 0.1 to about 2 feet in thickness.

The **Shawnee Group** of rocks is divided into seven alternating limestone and shale formations. The basal unit is the **Oread Limestone**, which caps the ridges and stream divides east of, and in the eastern part of, the collider oval. The Oread Limestone is the prototype "cyclothem," or model for cyclic, alternating limestone-shale deposition in the Pennsylvanian System of the Midcontinent. In this mode of deposition, an almost identical series of beds occurs repeatedly in upward succession, apparently caused by relative changes in sea level induced by some external mechanism on a global or regional scale at regular intervals spanning millions of years of geologic time. The ultimate causative mechanism continues to be debated. The various hypotheses are too numerous and complex to be reviewed here.

The reason for this discussion is to call attention to the repetitive occurrence of almost identical rock units in the same position in succeeding formations upward through several hundred feet of vertical sequence, illustrated in the following stratigraphic descriptions. The repetition of beds can be useful to experienced mappers, but it can lead to miscorrelations by inexperienced workers.

The **Toronto Limestone Member** is the basal unit of the Oread Limestone. It is a relatively thick-bedded, reddish-tan-weathering limestone with prominent, widely spaced through-going joints that are often widened by ground-water dissolution in the weathered zone near its outcrop. Its thickness ranges from 0 to 13 feet but is typically about 8 to 9 feet. (A more thorough discussion of jointing orientation and spacings for all units will follow in the structural-geology interpretation and engineering-geology or geotechnical sections.) The **Snyderville Shale Member** contains poorly laminated grayish-green shale suggestive of a poorly developed coal underclay. It appears to have been exposed to weathering at or slightly above sea level during Pennsylvanian times, and the ancient weathering features may be preserved, even at depth. Its thickness ranges from 0 to 45 feet, but it averages about 25 feet. The Toronto and some of the other beds of the lower Oread are sporadically missing in the vicinity of the eastern parts of the project, probably due to minor local warpings of the sea bottom which occurred at the time of deposition. This area is one of a few that are known in the region where the uniformity of deposition is interrupted. A fuller discussion follows in the section on structural geology.

The **Leavenworth Limestone Member** is a uniform, dense, bluish-gray limestone which is remarkably persistent over a large geographic area. It typically occurs as a single bed about 2 feet thick, but there are exceptions. At Pomona Dam it was reported to be 12 feet thick near the north abutment (U.S. Army Corps of Engineers, 1958). Joints are spaced about 4 to 5 feet apart and are usually tightly closed. The overlying **Heebner Shale** occurs as a couplet with the Leavenworth and is also extremely widespread and relatively uniform in appearance. Its thickness ranges from 4 to 20 feet but averages about 6 feet. It contains a zone of dark-gray to black, platy, or fissile, carbonaceous shale in its lower part, which is moderately radioactive and makes a prominent and characteristic "kick" on gamma ray-neutron logs, making it an excellent correlation marker for subsurface mapping. The Heebner and similar shales are thought to represent the deepest-water deposition of the typical cyclothem when conditions were stable and quiet for a relatively long

period of geologic time. The **Plattsmouth Limestone Member** is a moderately thick, wavy to platy-bedded unit containing some chert or flint nodules. The Plattsmouth is quarried extensively in the area for crushed rock for roads and concrete aggregate. It is typically about 13 feet thick but ranges upward to 22 feet. The **Heumader Shale** and **Kereford Limestone members** at the upper part of the Oread are both relatively impure and variable in thickness and composition. Because of this, the upper surface of the Oread is difficult to map. The Heumader ranges between 0 to 32 feet in thickness; the Kereford from 2 to 25 feet.

The **Kanwaka Shale** is composed mainly of silty or sandy shale and sandstone with a 3- to 5-foot-thick limestone bed in the middle. The Kanwaka averages about 60 feet in thickness. The **Jackson Park Shale Member** is the lower unit of the Kanwaka. It ranges between 25 and 52 feet in thickness. The **Clay Creek Limestone Member** in the middle of the formation is a blue-gray, fine-grained to granular limestone, massive in the lower and middle parts, and shaly in the upper part. It has widely spaced vertical joints. The **Stull Shale Member,** at the top of the formation, is about 18 to 35 feet thick. It contains sandstone and a few thin, impure, coaly layers.

The **Lecompton Limestone** consists of seven alternating limestone and shale members, which are very similar in thickness and description to the seven corresponding members of the Oread Limestone described in detail above. The members, from lower to upper, are the **Spring Branch Limestone, Doniphan Shale, Big Springs Limestone, Queen Hill Shale, Beil Limestone, King Hill Shale**, and **Avoca Limestone.** Thicknesses of individual units are shown in the generalized stratigraphic section (Figure 3.5). Thickness of the entire Lecompton Limestone is typically about 45 feet. Because the various units are so similar to the Oread, a detailed physical description will not be repeated. The Lecompton Limestone can be distinguished from the Oread by minor differences in the individual units, but the principal identifying feature is the presence of large, abundant, and well-preserved fossil horn-corals in the Beil Limestone Member, which is the principal limestone in the formation, occurring above the black platy shale unit in the cyclothem. The Tecumseh Shale is similar in composition to the Kanwaka Shale described above. Its thickness ranges from 25 to 70 feet but is typically about 55 feet. The principal difference is the absence of a well-developed middle limestone. The Tecumseh is not subdivided into members. The **Deer Creek Limestone** is divided into three limestone and two shale members. From the base upward, these are the **Ozawkie Limestone, Oskaloosa Shale, Rock Bluff Limestone, Larsh-Burroak Shale**, and **Ervine Creek Limestone members.** Except for minor variations in description and in thickness, these units are again essentially the same as those of the basic cyclothem units in the limestone formations described previously. Thicknesses of individual beds are shown on the stratigraphic sections on the geologic profile (Plates 3.3 [north] and 3.3 [south], in map tube). Thickness of the formation is 42 to 62 feet, averaging about 50 feet. For reference, the Rock Bluff Limestone Member and Larsh-Burroak Shale Member are the thin, dense limestone and black platy shale analogous to the Leavenworth-Heebner couplet in the Oread cyclothem. The main variation from the "standard" cyclothem is that the uppermost shale and limestone units either were not deposited or are poorly developed and are included in the upper part of the Ervine Creek Member. The **Calhoun Shale** is essentially similar in description and thickness to the Tecumseh described above in that it lacks a middle limestone unit and is not subdivided. Typical thickness is 30 to 60 feet, averaging 55 feet. The **Topeka Limestone** is divided into five limestone and four shale members where it is completely developed, but in the project area the two lowest limestone units make up most of the formation. The **Hartford Limestone Member,** which occurs at the base, is a thick-bedded limestone about 8 feet thick. The Iowa Point Shale Member, which usually occurs above the Hartford, is often missing and beds of the **Curzon Limestone Member** occur next upwards in the sequence near the SSC site. In the few sections where the Iowa Point was identified, it was about 3 feet thick. The Curzon is composed of interbedded limestone and limy shale and is 6 to 12 feet thick. A 2 to 5-foot-thick limestone at the top of the Curzon is the most prominent bed in the member. Strata above these basal limestones have been correlated with named beds, but they are relatively thin and can be simply described as alternating thin limestones and shales. These beds are cut out in some places by erosion at the base of a sandstone in the lower part of the **Severy Shale** in the site area. This sandstone makes up about half of the 70-foot thickness of the Severy formation in that vicinity. The upper part is silty shale. The Severy formation is the basal unit of the **Wabaunsee Group** of rocks.

The **Howard Limestone** consists of three limestone members, two shale members, and a coal bed that was mined extensively in the area at an earlier time.

The lowest unit, the **Bachelor Creek Limestone Member,** is a hard, very sandy bed averaging about 6 feet in thickness. In the Scranton area and northward, a sandstone or sandy shale occurs in place of the limestone. The **Aarde Shale Member** overlies the Bachelor Creek where it is present. The **Nodaway coal bed** occurs 1 to 6 feet above the base of the Aarde. It is a bituminous coal ranging from a few inches to as much as 36 inches thick, but averaging about 18 inches. The Nodaway coal was mined extensively in the area from before 1867 through about 1950. There were some 300 mines in all, about a third of which were underground

shaft mines; the remainder were strip pits. All but a few strip pits and very shallow and small underground mines are well outside the vertical and horizontal units of the proposed construction. These will be discussed in detail in section 3.2.4. The remainder of the Aarde Member is mainly silty shale, with a zone of black platy shale in its upper part. The **Church Limestone Member** is a 2-foot-thick single, hard bed of bluish-gray limestone. The overlying **Winzeler Shale Member** is about 3 feet thick. The **Utopia Limestone Member** occurs at the top of the formation. It consists of a basal 2-foot-thick limestone, overlain by 2 to 4 feet of dark-gray fissile shale. Above this shale is a zone of several feet of fine-grained flaggy limestones. The uppermost bed of the Utopia is a 1-5-foot-thick limestone having an "oatmeal" texture caused by fossil algae deposits.

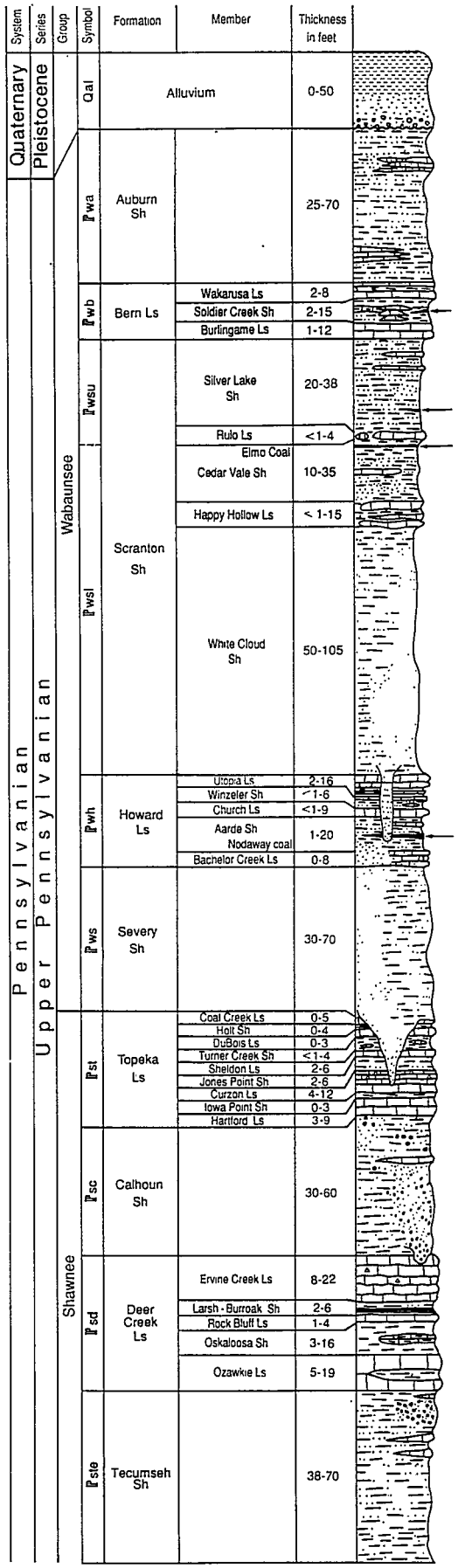
The **Scranton Shale** is divided into three shale and two limestone members. In the project area, the **White Cloud Shale Member** is represented mainly by a fine-grained mica sandstone, which has an irregular base caused by channeling that in some areas cuts into and through the underlying Howard Limestone. Where this occurs, the basal 1 foot or so may be a conglomerate. The upper part of the White Cloud is clayey to silty shale. Total thickness ranges from 50 to 105 feet but average about 80 feet. The **Happy Hollow Limestone Member** is composed of thin, impure limestone beds interspersed with sandy shale layers. It ranges from about 4 to 9 feet in thickness in the project area. Occurring as it does between two thicker shale units, it does not make a strong outcrop and is difficult to map. The **Cedar Vale Shale Member** is a silty to sandy mica-bearing shale having a sandstone in its upper part in some places. The **Elmo coal bed** occurs near the top of the unit. The coal is ordinarily less than half a foot thick. The average thickness of the Cedar Vale Shale Member is about 25 feet. The **Rulo Limestone Member** usually occurs as a single bed of blue-gray limestone having a "knobby" appearance caused by mottling and differential weathering. It averages about 2 feet thick. The **Silver Lake Shale Member** is mainly silty to sandy shale with a sandstone and very thin coal near its middle. Average thickness is about 35 feet.

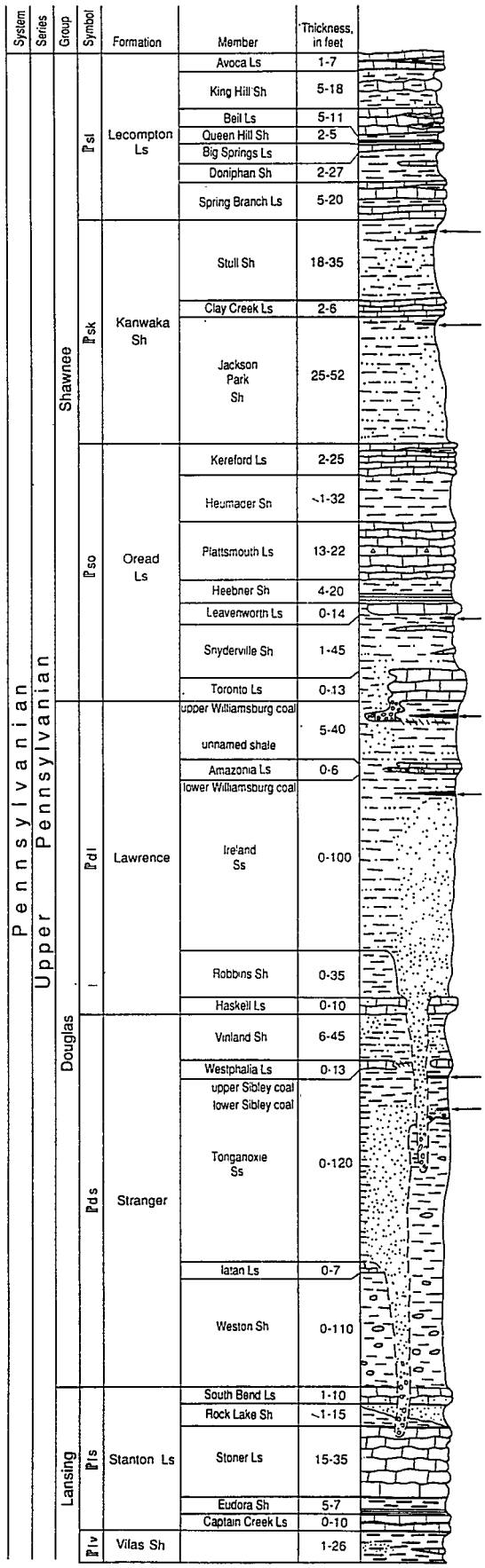
Members of the **Bern Limestone** are the stratigraphically and topographically highest geologic units on the proposed project. They occur in the vicinity of J4 in the extreme northwest tip. The basal unit of the Bern is the **Burlingame Limestone Member,** which is variable in both thickness and appearance, ranging from a thick-bedded, fossiliferous limestone to a broken-appearing, crossbedded, fossil "hash." Its thickness averages about 3 feet but ranges from about 2 to 9 feet. Above the Burlingame is the silty to clayey **Soldier Creek Shale Member,** which may contain limestone nodules and a very thin coaly layer in some places. The thickness of the Soldier Creek reportedly ranges from 2 to 7 feet. The uppermost bed likely to crop out is the **Wakarusa Limestone Member,** which is a thick-bedded to massive limestone. Its thickness is reported to be 3 to 8 feet.

Stream valley **alluvial and terrace deposits** in the three major streams that cross the proposed project are derived from a soils and sedimentary-rock sequence similar to what occurs in the area itself and are primarily silty clays to fine sandy clays with minor limestone and cherty gravel from their heads near the Flint Hills to the west. The alluvium and older terrace deposits were not differentiated on the geologic map. The alluvial materials are not expected be encountered in the collider tunnel or other major construction on the project.

Soils on the uplands and hillslopes are principally silty clay loams with clayey subsoils. The soils were not mapped or included on the profile because they are relatively thin, averaging less than 5 feet in most of the collider oval and vicinity. Two major soils associations are recognized. The **Eram-Lula-Summit** occurs in about the eastern third of the project. It is developed on the uplands and slopes underlain by the limestone-dominated bedrock of the Shawnee Group. The **Kenoma-Woodson** occupies the level to moderately sloped uplands underlain by the shale-sandstone-dominated bedrock in the western two-thirds of the project. Soils of floodplains and valley deposits, which are a quantitatively minor part of the project, are of the **Verdigris-Osage** association, which is again predominantly silty clay.

FIGURE 3.5—GENERALIZED STRATIGRAPHIC SECTION OF GEOLOGIC UNITS AT OR IN THE VICINITY OF THE PROPOSED KANSAS SSC SITE (FACING PAGE).


System
Series
Group
Symbol
Formation
Member
Thickness in feet
Quaternary
Pleistocene
Pennsylvanian
Upper Pennsylvanian
Wabaunsee
Shawnee
Qal
Alluvium
0-50
Pwa
Auburn Sh
25-70
Pwb
Bern Ls
Wakarusa Ls 2-8
Soldier Creek Sh 2-15
Burlingame Ls 1-12
Pwsu
Silver Lake Sh 20-38
Rulo Ls <1-4
Elmo Coal
Cedar Vale Sh 10-35
Happy Hollow Ls <1-15
Pwsl
Scranton Sh
White Cloud Sh 50-105
Pwh
Howard Ls
Utopia Ls 2-16
Winzeler Sh ~1-6
Church Ls <1-9
Aarde Sh 1-20
Nodaway coal
Bachelor Creek Ls 0-8
Pws
Severy Sh 30-70
Pst
Topeka Ls
Coal Creek Ls 0-5
Holt Sh 0-4
DuBois Ls 0-3
Turner Creek Sh <1-4
Sheldon Ls 2-6
Jones Point Sh 2-6
Curzon Ls 4-12
Iowa Point Sh 0-3
Hartford Ls 3-9
Psc
Calhoun Sh 30-60
Psd
Deer Creek Ls
Ervine Creek Ls 8-22
Larsh - Burroak Sh 2-6
Rock Bluff Ls 1-4
Oskaloosa Sh 3-16
Ozawkie Ls 5-19
Pste
Tecumseh Sh 38-70


System
Series
Group
Symbol
Formation
Member
Thickness, in feet
Pennsylvanian
Upper Pennsylvanian
Shawnee
Douglas
Lansing
Psl
Lecompton Ls
Avoca Ls 1-7
King Hill Sh 5-18
Beil Ls 5-11
Queen Hill Sh 2-5
Big Springs Ls
Doniphan Sh 2-27
Spring Branch Ls 5-20
Psk
Kanwaka Sh
Stull Sh 18-35
Clay Creek Ls 2-6
Jackson Park Sh 25-52
Pso
Oread Ls
Kereford Ls 2-25
Heumader Sh ~1-32
Plattsmouth Ls 13-22
Heebner Sh 4-20
Leavenworth Ls 0-14
Snyderville Sh 1-45
Toronto Ls 0-13
Pdl
Lawrence
upper Williamsburg coal
unnamed shale 5-40
Amazonia Ls 0-6
lower Williamsburg coal
Ireland Ss 0-100
Robbins Sh 0-35
Haskell Ls 0-10
Pds
Stranger
Vinland Sh 6-45
Westphalia Ls 0-13
upper Sibley coal
lower Sibley coal
Tonganoxie Ss 0-120
Iatan Ls 0-7
Weston Sh 0-110
Pls
Stanton Ls
South Bend Ls 1-10
Rock Lake Sh ~1-15
Stoner Ls 15-35
Eudora Sh 5-7
Captain Creek Ls 0-10
Plv
Vilas Sh 1-26

Structural Geology of the Region and Site

Major geologic structures of the region are outlined in Figure 3.6. Principal features in eastern Kansas are the Nemaha Ridge, Forest City Basin, Bourbon Arch, and Cherokee Basin.

The Nemaha Ridge is a buried ridge of Precambrian granite with truncated younger sedimentary rocks along its flanks and draped over its crest. Although the Nemaha was probably a positive tectonic feature at several times from the Precambrian onwards, its main and dominant period of uplift occurred during Early and Middle Pennsylvanian times, coinciding with and related to continental collisional tectonics in the southern Appalachians and Ouachitas. The eastern side of the Nemaha Ridge is bounded by the Humboldt fault zone which extends from southeast Nebraska, through Kansas into Oklahoma. Work in progress at the Kansas Geological Survey suggests that the Humboldt zone is only the most apparent fault along the uplift because of its position bounding the eastern flank of the Nemaha. The entire uplift itself is complexly broken up by northwest-southeast-trending, en echelon blocks that have been differentially uplifted to form a series of horst and graben structures, eroded along its crest.

East of the Nemaha Ridge are the Cherokee and Forest City basins divided by a low west-northwest-east-southeast-trending threshold, the Bourbon Arch. The Cherokee Basin is actually a shallow embayment on the shelf of the Arkoma Basin to the south. The Bourbon Arch, which separates the Cherokee from the Forest City Basin, is a broad, low feature that is detected mainly by depositional changes in rocks overlying it. The Forest City Basin is actually a half basin formed when uplift of the Nemaha structure split a much larger basin in northern Kansas and southern Nebraska. The present Salina Basin is the western part of the older Northern Kansas Basin and the present Forest City is the eastern part. Because of this, the Forest City Basin is strongly asymmetric, its deepest part is adjacent to and paralleling the abrupt east flank of the Nemaha Ridge. The eastern boundaries of the basin are not well defined because the east side of the basin is, in fact, the gently sloped flanks of the Ozark Uplift.

The strong north-northeast-south-southwest-trending features such as the Nemaha and related structures cut across a more subtle but pervasive northwest-southeast grain that probably is controlled by similarly trending major fracture systems in the Precambrian terrane that have been passively reactivated from time-to-time by both horizontal regional stresses and differential vertical movements, mainly subsidence with lag.

The pervasive gentle westward dip of all beds older than Cretaceous that dominates the present-day aspect of the surface stratigraphy in Kansas, and which has been described in earlier sections, is generally believed to have been caused by final uplift of the Ozark dome.

The proposed project itself is located in the south part of the Forest City Basin. Minor structural features at the surface and in the shallow subsurface were formed principally during Pennsylvanian times, some while the sediments were being deposited or before immediately overlying strata were laid down. This is demonstrated by observation of abrupt changes in lithology on either side of some known faults such as missing beds caused by non-deposition, or by Pennsylvanian-age erosion. The principal tectonic movements were probably caused by compressional, horizontal, regional stresses transmitted in the Precambrian basement and the thick carbonate sequences above it. As stated previously, the major source of the stress is believed to be the continental-collision episodes that formed the Ouachitas. Localized tectonically related structures were formed secondarily by minor buckling and faulting in overlying thin beds in response to both vertical and horizontal jostling of fault-bounded basement blocks.

Structure of the Site Area

Plate 3.5 (in map tube) is a structure-contour map drawn at the top of the Lawrence Formation, which is the datum closest to the proposed underground placement of the collider oval. It is designated as "top of Lawrence Formation" because it also shows, in the southeast quadrant, the eroded top of the shale beneath the stream valleys and its projected top where a true top is absent because of erosion. Where strata above the actual or stratigraphic top of the Lawrence are present, the datum is also the base of the Oread Limestone and the boundary between the Douglas Group below and the Shawnee Group above. This map is one of several drawn from existing oil- and water-well records. Numerous well-to-well cross sections were also drawn to make projections used to develop the detailed profile of the underground geology around the collider oval. These source and work materials are too voluminous to include in the proposal document but are on file at the Kansas Geological Survey.

The regional dip to the west-northwest-east-southeast is the dominant feature. Undulations in the contour lines and closed circular and other features indicate areas above or below the general sloping dip plane. Their shapes are not particularly significant because the uneven distribution of some of the data points causes single isolated points or closely spaced clusters of points to be contoured as circles or as complex curves, as is the case in several places on the map. The data are useful, nevertheless, for determining placement of the tunnel and for suggesting areas of possible anomalous geology. Some of the anomalous areas are near mapped surface faults, and it is probable that some of the closed contours also represent faulting.

There are only two mapped surface faults near the collider oval (Plate 3.2, in map tube). The closest, located between E4 and F4 in the southeast quadrant, offsets strata

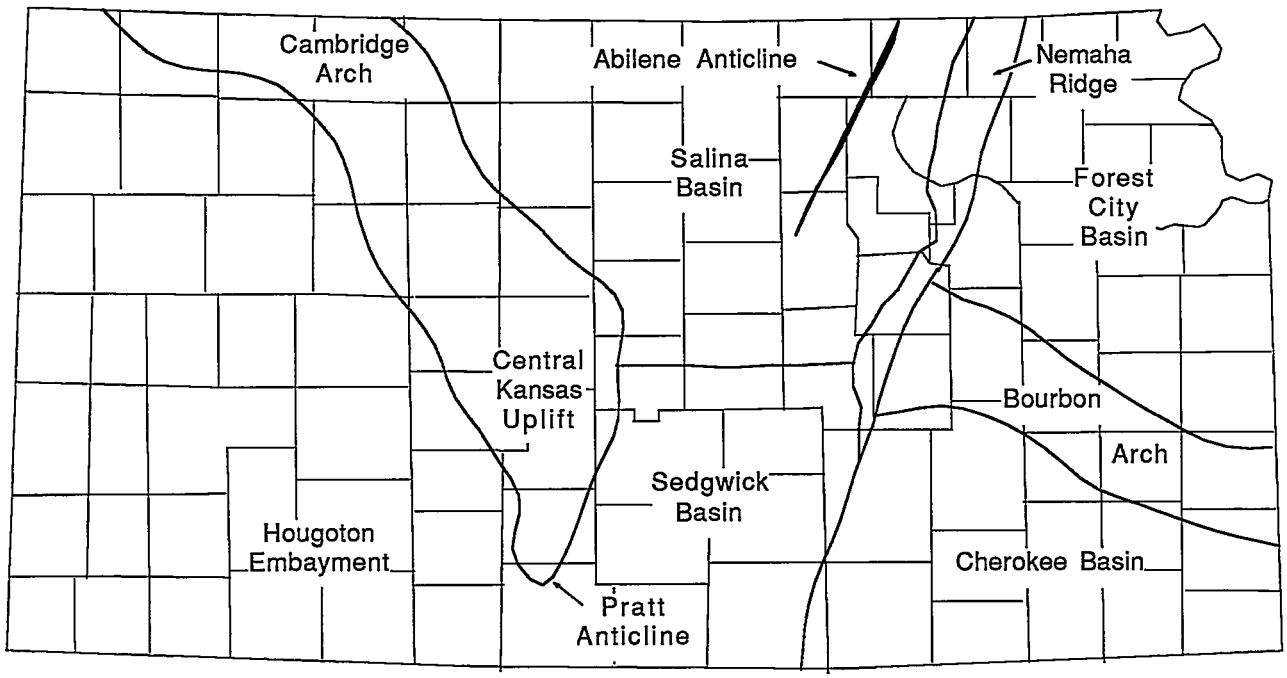


FIGURE 3.6--MAJOR STRUCTURAL GEOLOGY FEATURES IN KANSAS.

in the upper part of the Douglas Group by a reported 30 to 40 feet (O'Connor, 1955, p. 19), with the apparent down side to the south or away from the tunnel alignment. The fault strikes N. 60°E.-S. 60°W. across a topographic nose or spur that extends into the valleys of Salt Creek and Hundred and Ten Mile Creek at their junction. An isolated, triangular-shaped block of lower Oread Limestone occurs at the tip of the topographic nose on the downdip side of the fault and is separated from the main outcrop of the Oread to the northwest by a strip of Lawrence shale in which the fault is located. Both the outcrop of the main Oread and the base of the triangular outlier of the Oread are truncated parallel to the fault, and when the two are visually juxtaposed, it appears that they would match. A photograph of the actual fault plane taken in a freshly cleaned backslope of the road in the mid-1950's (O'Connor, 1955, plate 4-9) shows it to be almost flat-dipping, at only about 10° from horizontal. The plane is a very sharp break with no apparent weathering. From these observations it seems probable that the so-called fault is actually the plane of movement or glide plane of a large rotational- or block-glide landslide of probable Pleistocene age. Either type of sliding could have been caused by erosion of the stream-valley wall, resulting in loss of lateral support. Whether or not the gliding occurred on a pre-existing fault is problematic. The extremely low angle of dip is unusual for a tensional fault, however. In any case, the projected plane of movement is away from the proposed alignment of the collider tunnel on its downdip side and projects above the ground surface on the tunnelward side.

Another isolated outlier of lower Oread Limestone occurs in a very similar position at the end of an outcrop spur immediately across the valley to the east and on line with the east-northeast projection of the possible fault described above. No faulting is mapped there, and if it were, the conclusions would be similar to those above but would strengthen the possibility that the slide movement was along a pre-existing fault plane.

The second mapped fault is about 1.5 miles north-northwest of the town of Pomona, east of shaft E4 on the collider oval. It trends approximately N. 45° E.-S. 45° W. The fault has its apparent down side to the northwest and estimated displacement from projected stratigraphic evidence is about 30 feet (Ball and others, 1963, p. 38). The same beds of the lower Oread as in the above descriptions are involved. Dip of the fault plane is not reported. The Pomona and Pomona North gas fields occur in the subsurface along the projected trend of this fault, but no offset is apparent in a reliable marker bed (base of Kansas City Group) in the upper parts of logs of development wells in this field. This suggests that the faulting occurs within the Oread and upper Douglas rocks, shortly after they were deposited. This conclusion is reinforced by similar observations and conclusions by O'Connor (1955) and Ball and others (1963) with respect to apparently faulted beds, disrupted and tilted beds, abrupt changes in facies, or missing beds, which they describe in other areas east of the site.

F. W. Wilson (personal observation) has also seen similar, but less severe disruption of beds and minor faulting that were uncovered during construction at the Wolf Creek Generating Station, a nuclear power plant 30 miles south of the site. Because evidence of faulting at Wolf Creek Station was important to its site safety review by NRC, these occurrences were exhaustively studied and in every instance geologic proof was present to substantiate that the faulting and disruption of bedding had occurred during or shortly after deposition and was of Pennsylvanian age.

Further south, near the Kansas-Oklahoma border, "fossilized" liquefaction structures or "earthquake fountains" are preserved in formations of approximately the same age as those at the site (Frank Wilson, personal observation). The widespread occurrence of these phenomena at about the same stratigraphic horizons suggests that earthquake activity may have been intense during certain episodes of continental collision in the Ouachita Mountains area to the south and that it triggered deformation of the poorly indurated or partly saturated sediments over a wide area. This conclusion also leads to the assumption that faulted and disturbed beds may occur and be found in the basal Oread and upper Douglas rocks at unpredictable locations in the subsurface of the proposed site area.

Orientation of Rock Joints

A study of jointing in the Plattsmouth and Leavenworth limestone members of the Oread Limestone and the Ervine Creek and Rock Bluff limestone members of the Deer Creek Limestone in northeastern Kansas, including the site area, was reported by G. F. Stewart (1967). Stewart made 881 measurements at 10 localities. The Plattsmouth and Ervine Creek limestone members are both about 10 to 15 feet thick and consist of medium crystalline, wavy-bedded gray limestone with thin shale partings. Northwest-trending and northeast-trending joints cut all single beds at various spacings, but dominant joints in both members trend N. 60° E. to N. 65° E. The dominant northeast-trending joints are near vertical, long, planar, and distinct. The jointing cuts completely through the multiple bedding of the members. The less dominant, N. 30° W.-trending joints are short, irregular, and commonly do not cut through the entire thickness of the two members. The Leavenworth and Rock Bluff members are typical of the finely crystalline, blue-gray, dense, thin limestone units occurring below the black platy shale unit of the "cyclothem" described in the section on stratigraphy (Section 3.2.3). They occur in single uniform beds averaging about 2 feet in thickness. The dominant set of joints in the two units trends N. 55° E. The joints are abundant, long, and planar and commonly show feather-fracture markings considered to be indicative of shear. The less dominant N. 30° W. to N. 40° W.-trending joints are not as abundant and commonly extend only from one northeast-trending cross joint to the next. Their faces are quite rough. Both of the two limestone members contain short, smooth-faced, and tightly closed north-trending joints that do not completely cut through the beds.

Stewart (1967) speculated that although both sets of joints were tensional, the northeast-trending sets were horizontally stressed when fractured and that this released stress caused the shearing effect indicated by feather-fracture markings on the joint faces. Direction of shear was not indicated. He also noted on the dominant northeast trend, that new-appearing, sharp joints occurred side-by side with joints showing mineral stains and slight dissolution. He speculated that this was an indication of two periods of jointing. The orientations of major joints in other stratigraphic horizons in the project area are similar to that described by Stewart.

The horizontal spacing of joints is approximately equal to the thicknesss of the unit or bundle of units cut by the joint. Thus the spacing of through joints in a 15-foot-thick bed will be about 15 feet, and so on. This rule of thumb seems to apply best to the thicker, multibedded limestone units such as the Plattsmouth and Ervine Creek.

In the project area and in northeast Kansas generally, it has been noted that near the outcrop of various units, where natural erosion has relieved stress (as near stream-valley edges), the dominant northeast-trending joint set is usually open, sometimes solution-widened, and partially clay-filled. The northwest-trending set is less open and less solutioned. This may be an indication of a contemporary horizontal stress applied from the east-northeast which acts at near right angles to the northwest-trending joints, tending to keep them closed, while opening the northeast-trending ones which its acts on obliquely. Some of the open joints contain glacial fill of Kansan age and a transported loess of probable Wisconsinan age (Frank Wilson, personal observation, 1987). Further evidence of probable contemporary stress is discussed in Section 3.2.4.

Jointing and fracturing of shales has not been studied, or at least not reported, in a systematic fashion. Wilson has noted a phenomenon in shales in eastern Kansas which applies to beds in the project area but may be a more general phenomenon applying to shales generically. Numerous slickensides and inclined fractures that appear not to be offset, except minutely, are frequently reported in descriptions of cores of unweathered shale taken on various construction projects in eastern Kansas. Close examination of unweathered shales in newly opened excavations of various types also reveals closely spaced and numerous slickensided surfaces and sometimes inclined sharp fractures extending through several feet of horizontally bedded shale before they die out in undisturbed shale or abut a more competent bed. The slicken-

sides and fractures are commonly inclined at about 60° from horizontal or from the plane of bedding in the shale. They are often aligned in a parallel fashion in any particular exposure but through-cutting, long fractures, or joints, sometimes are inclined opposite to each other and intersect in an upward direction. As stated, little or no offset of bedding is observed. The slickensides and fractures usually are observed below the bases of limestone beds or other competent layers and die out downward within 10 feet or less. These features are not tectonic but are caused by final compaction of the shale in a semibrittle state by overburden pressure caused by the thickening sequence of sediments being deposited upon them. Upon removal of support by excavation, the retained stress is relieved and spalling of the shale results. Blocks of shale adjacent to the inclined through-going joints or included between oppositely inclined joints may fall out as blocks. This usually occurs if the face is left unsupported for a period of time that varies in length according to the mineralogy, strength, and state of stress of the rock. The preferred or recommended lining method using precast-concrete liner segments erected immediately behind the TBM shield minimizes this problem in construction of the tunnel, but should be considered in connection with shaft sinking and construction of large underground chambers discussed below.

3.2.4 Geologic Features of the Proposed Site which May Require Special Consideration in Design, Construction, and Operation

The features described are not major ones and involve things that occur frequently on many underground projects and are routinely considered in the investigation, design, and construction. The possible occurrence of natural gases, unexpected water inflows, and possible settling, squeezing, or caving ground are common enough that standard or generic design and construction practices for underground projects have been evolved by experience to include checks and safety features to obviate them.

Natural gas in minor quantities and residues of crude oil may be encountered in the tunnel and shaft excavations on the project. Traces or "shows" of natural gas and crude oil were reported at shallow depths in logs of several older oil and gas exploration holes that were drilled in the vicinity of the site, presumably by cable-tool methods which are more likely than rotary-drilled holes to detect very small quantities of oil or gas.

These "shows," which cannot be evaluated quantitatively, may simply be an oil sheen or ignitable bubbles in the water bailed as the holes were being drilled. All of the holes were abandoned after completion so the quantity was very small. The shows were noted from wells near the northwest and southeast quadrants of the collider tunnel in formations that will be penetrated by shafts and will be close to the elevation of the main tunnel alignment. They occur from formations near enough to the surface that it seems unlikely that any significant concentrations could remain at such shallow depths. Nevertheless, it is likely that small quantities of gas and possibly oil may be encountered during shaft drilling and tunneling, and, unless the surfaces are properly sealed, may occur in the tunnel and underground chambers afterward. Adequate ventilation during construction and operation probably will dissipate the gases if they do occur, but gas-detection devices and permanent monitoring equipment may be advisable.

The extant records of the locations of oil, gas, water and other drill holes in the site region, either existing or abandoned, were collected from various state agencies. The location of all known oil and gas exploration and production drill holes in the vicinity of the facility are shown on the geologic structure map (Plate 3.2, in map tube). These are on file at the Kansas Geological Survey. It is possible that some wells, drilled before records were required to be kept, are present in the area.

Several existing water wells and abandoned oil and gas exploration holes appear to be near or on the proposed tunnel alignment. The locations of existing wells will be accurately surveyed during land acquisition if the Kansas site is chosen, but it will probably be necessary to interview people in the vicinity of the locations of the abandoned holes to determine, if possible, where the wells were actually drilled. The possibility of the driven tunnel actually encountering an abandoned drill hole with casing intact is very remote, but must be considered.

The possibility that unexpected or larger than predicted flows of water may be encountered during construction must also be considered. An estimate of the maximum amount of ground water that may be encountered in tunneling and underground excavation is made in the section on geohydrology (Section 3.3 3). Although this is based on the best available data and is believed to be typical and realistic, no safety or contingency factor was added. The data are sparse and clustered, and it is possible that areas of greater porosity, permeability, or potentiometric head may exist in the known aquifers and not have been sampled. The most likely such occurrence would be coarser sand or gravel contained in conglomerates at the bases of local unconformities or in channel-fill deposits in the sandstone bodies present in the thicker shale units. As described in the section on geologic structure, undetected or unpredicted faults may occur in normally dry or less permeable parts of the stratigraphic section and may contain water under a hydraulic head either from the surface or a confined aquifer above or below the plane of the tunnel. Because the known faults that occur in the area do not have significant gouge-filled

shear zones, large inflows of water are not expected. These flows, if they are encountered at all, will affect the tunneling operation only temporarily until the TBM penetrates through the zone and lining can be placed and grouted behind the tail of the shield.

Evidence exists to suggest that an ambient or contemporary horizontally directed compressive stress field affects the rocks of the eastern United States including the site area. Zoback and Zoback (1980) in a summary of existing data for the United States included a point in eastern Kansas that was derived from a first-motion analysis of a microearthquake that was recorded west of the site in 1978 by Don Steeples (personal communication) of the Kansas Geological Survey. The analysis indicated only that movement on the fault was up, indicating compression. The data were not sufficient to permit a fault-plane analysis, and orientation of the horizontal axis of least stress was inferred from the approximate north-south alignment of known subsurface structures in the vicinity including the nearby Humboldt fault zone described in Section 3.2.1.

F. W. Wilson has investigated, but not published, observations of three apparent stress-relief "pop-ups" that occurred suddenly in operating limestone quarries at Humboldt, about 65 miles south-southeast of the site; at Ottawa, about 25 miles east of the site; and in an excavation during construction of the Wolf Creek Generating Station, a nuclear power plant about 30 miles south of the site. All three of the occurrences were apparently triggered either by dewatering or temperature-change effects and occurred along, but subparallel to, existing major joints, so it is not clear that they are indicators of regional compressive stress. However, all were linear traces trending approximately N. 30° W.-S. 30° E. and extended for several hundred feet in zig-zag, generally left-stepping fashion, across the width of the respective excavations. Maximum upward displacement at the apex of the pop-ups was slightly in excess of 1 foot, and in several instances the limestone plates on the relative northeast sides of the features were shoved about 2 inches over the plates on the relative southwest side. If taken as evidence of horizontal compression, the three occurrences would be consistent with a generally west-southwest-directed regional horizontal compressive stress field as suggested by other evidence including open and closed joints described in the section on structural geology. The magnitude of the stress probably is not great enough to cause squeezing or deformation of the tunnel walls, but in-situ measurements should be made if the Kansas site is chosen for the best-qualified list. The features and processes described above are the only geologically related ones that may affect operations at the proposed site.

Ground settlement or subsidence at the surface caused by tunneling or underground construction is not expected because of the anticipated and preferred method of rapid machine tunneling and installation of pre-cast, reinforced concrete liner segments immediately behind the TBM. An additional safety-factor is provided by the laminated-beam or plate-effect of the alternating limestone-shale strata in the overburden above the tunnel.

Unstable slopes are not a factor at the site because the soils, unconsolidated materials, and bedrock do not contain swelling clays or other unstable minerals. Standard slope design for highway cuts and similar excavations in the region routinely call for 3:1 (horizontal to vertical) slopes in soils and soft unconsolidated materials, 2:1 for weathered shales, 1:1 for unweathered shales and sandstones, and 1/4:1 or vertical for limestones.

The geologic units to depths of about 1,000 feet beneath the site are principally shale and sandstone with thinner limestone beds which are not subject to sinkhole or cavern development. No major subsidence features are known to occur as a result of solutioning or withdrawal of subsurface liquids and gases.

Coal mining has been described previously in the area to the west of the proposed site. Mining of a coal bed averaging about 18 inches in thickness up to a maximum of about 36 inches, in a few places, was done by shallow surface stripping and shallow underground mining not exceeding 200 feet deep. Underground mining was by hand, using the retreating long-wall method with vertical shafts sunk to the level of the coal and narrow drifts or haul tunnels driven horizontally and radially outwards from the central shafts. Panels of coal between the haulways were mined using approximately 3-foot-long timber props to support the roof immediately adjacent to the face. Props were subsequently knocked out for use at the advancing face and the cavity allowed to settle or converge under overburden pressure. All known existing information and maps of the mined-out areas are located at the Kansas Geological Survey. None extends beneath the project area. A few small areas of shallow (surface) strip mines and two shallow underground mines occur near shafts F9 and E9, but the mines will not be encountered in the shafts. The areas of deeper mining are higher in elevation than the collider tunnel and a considerable distance from its alignment.

Active faults are not known nor are they suspected to exist in or near the project area. If they did exist, they would not be expected to cause surface displacement in the event of an earthquake. Geologic structures, related tectonics, and seismicity are addressed in Sections 3.2.3 and 3.4.

3.2.5 Soft Clays, Unconsolidated Sands, or Other Soil Conditions

Soft clays, unconsolidated sands, and similar materials occur only in the two major stream valleys or beneath reservoirs in the site vicinity and are avoided by

locating the main tunnel in firm, unweathered shale beneath the streams. The soils and unconsolidated materials existing beneath the uplands and adjacent slopes are relatively thin and are not likely to cause excavation or foundation problems.

3.2.6 Location of Data Sources

All data, air photos, work maps, digitized mylar base maps and completed maps, geologic cross sections, and profiles used for the preparation of Volume 3 are on file at the Kansas Geological Survey at the address shown below. Contact persons for that information are Frank Wilson (senior geologist), Pam Chaffee (research assistant), and David Collins (manager, technical information services). The well records used to develop materials presented in Volume 3 include the following: Form WWC-5 Water Well Records, filed with the Kansas Department of Health and Environment (address below); Form ACO-1 Well Histories, filed with the Oil and Gas Conservation Division, Kansas Corporation Commission (address below); Driller's logs, other than Form ACO-1, filed with the Kansas Geological Society (address below) and the Kansas Geological Survey; and sample logs, completion cards, geophysical well logs, and water-well records on file at the Kansas Geological Survey. All of those data are available to the public.

Kansas Geological Survey
1930 Constant Avenue
West Campus
University of Kansas
Lawrence, Kansas 66046-2598
(913) 864-3965

Kansas Department of Health and Environment
Forbes Field
Topeka, Kansas 66620
(913) 862-9360

Kansas Corporation Commission
202 W. 1st Street
Wichita, Kansas 67202
(316) 263-3238

Kansas Geological Society
212 N. Market, Landmark Square
Wichita, Kansas 67202
(316) 265-9857

SSC Project Office
Kansas Department of Commerce
400 W. 8th, Suite 500
Topeka, Kansas 66603
(913) 296-5272

3.3 GEOHYDROLOGY

3.3.1 Geohydrological Regimes

Figure 3.7 shows the proposed SSC site area divided into regions based on occurrence of ground water in various geologic regimes. The regions and subregions were determined by principal aquifers; enclosing material or rock type; whether the aquifers were unconfined or confined; manner of recharge and discharge; permeability or hydraulic conductivity; water quantity and quality; and effects of climatic variability. Regional boundaries are somewhat generalized and exceptions to the broad discussion occur in each region. In the general SSC site region, primary recharge of the ground-water system is by atmospheric precipitation, which averages about 33 inches per year, the bulk of which falls as rain during March through June.

Region 1 delineates major stream valleys containing alluvial deposits composed mainly of unconsolidated silt and clay with some minor admixed fine sand and included thin lenses of medium sand and gravel, which become coarser and thicker near the basal bedrock contact. Thickness of the alluvial deposits ranges from about 5 feet in smaller valleys to about 50 feet in the lower and broader parts of the major tributaries to Marais Des Cygnes River. During wet periods, recharge to the valley deposits is directly from precipitation and runoff from the watersheds of the various streams, which contributes to bank storage during periods of high streamflow or release of water from artificial impoundments in the immediate area and upstream. During wetter periods, discharge from alluvial deposits is mainly by infiltration into underlying permeable bedrock units, especially the sandstones.

During dry periods and periods of low or no streamflow, the alluvial deposits are recharged by seepage and springs from permeable bedrock units occurring at higher elevations in the valley walls, or upstream watersheds and from confined bedrock units with differentially higher potentiometric heads. Natural discharge during dry periods is to streams by bank and bed seepage to permeable bedrock in areas of lower head and to the atmosphere by evaporation and transpiration of plants.

Because the alluvium is derived mainly from the sedimentary rocks in the upstream basins and has been transported by generally low-gradient streams, it contains a relatively high proportion of clay, silt, and fine sand. The coarser materials, seldom larger than gravel size, are generally thin, discontinuous lenses of limestone and chert gravel mixed with finer material. Permeabilities will obviously vary; depending on location, wells in the alluvial deposits of the major stream valleys in the SSC vicinity can be developed to yield 10 to more than 50 gallons per minute (gpm) with good dependability except in periods of major drought. Natural water-table levels in

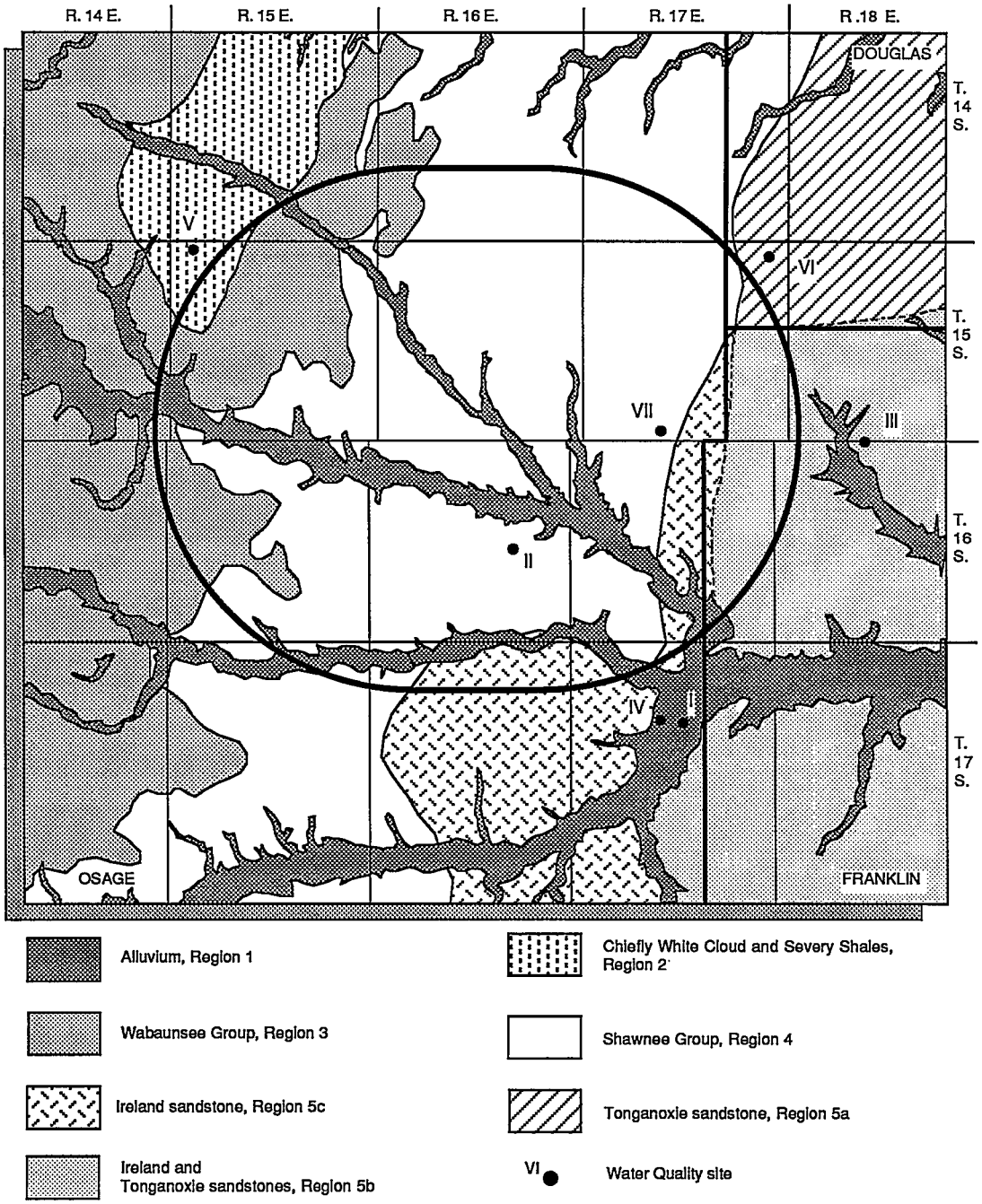


FIGURE 3.7--GROUND-WATER REGIONS AND REPRESENTATIVE WATER-QUALITY SITES IN THE SSC AREA.

valleys where stream flows are not affected by major reservoirs may fluctuate 20 feet or more during a 20-to-30-year climatic cycle containing both extended wet and dry periods. Quality of water as indicated by total dissolved solids (TDS) is generally good, ranging from 278 to 2,640 parts per million (ppm) and averaging 1,068 ppm.

Region 2, in the northwest part of the SSC area, is topographically and structurally high and underlain by sedimentary bedrock of the lower Wabaunsee Group which is dominated by sandy to silty shales. Ground water in this region is relatively sparse because of the higher topographic and structural elevation, limited catchment area for precipitation, relatively well-drained upland soils, less permeable bedrock, and dissection by streams around its margins.

The main but limited source of ground water is from wells drilled into the sandstones or sandy shales of the White Cloud Shale Member of the Scranton Shale and the Severy Shale. Wells range from 60 to 240 feet in depth and reportedly yield less than 1 gallon per minute to

as much as 20 gpm. Availability is obviously quite variable, and average yields are on the lower end of this range. The quality of water is generally good, ranging from 656 to 3,440 ppm and averaging 1,679 ppm in total dissolved solids. Chloride contents ranging from 24 to 470 ppm along the western margins of the area may limit the usefulness of the aquifers for domestic purposes in that area. Water supplies from natural sources in this region are marginal at best and, for reasons cited above, quite vulnerable to the effects of prolonged dry periods.

Region 3 occupies the western part of the SSC site area and consists mainly of moderately sloping to nearly level uplands developed on gently westward dipping sedimentary bedrock units of the middle and lower Wabaunsee Group, again chiefly composed of silty to sandy shales and some interbedded limestones. The soils are similar to those in Region 1, although possibly less drained because of a more clayey subsoil. The region is larger in extent and more gently sloping than Region 2 and gains more recharge from direct precipitation to the soils and shallow weathered bedrock. It is drained mainly by Dragoon Creek and its tributaries, which have a more extensive catchment area to the west and broader valleys with more extensive areas of alluvium that also contribute recharge to the underlying sandy shale or fine sandstone zones in the bedrock. The sandstones are composed mainly of very fine to medium grained rock, however, and permeabilities are relatively low. Sandy zones occur locally in nearly all of the shale formations, but the zones are not individually extensive or thick. Wells into the weathered bedrock zone and perched aquifers in these units are shallow, usually 30 feet or less in depth, and yield less than 1 gallon per minute to only about 5 gpm. A few wells are deeper but these often contain enough dissolved solids to make them marginal for domestic use. Locally, some of the limestone beds have enough secondary permeability to yield small amounts of water to shallow, large diameter wells, but in other places, below a depth of 40 to 50 feet, the beds yield little or no water.

Quality of produced ground water is similar to that in Region 4, discussed below.

Region 4 is underlain by the alternating limestone-shale bedrock terrane of the Shawnee Group. It is the largest of the five regions and contains units that occur at the surface or will be encountered in much of the underground construction associated with the major shafts and injector complex at the north side of the collider oval and the interaction area in the south cluster, as well as major segments of the collider tunnel. The western part of the region consists of gently sloping to nearly level uplands underlain by moderately well-drained to somewhat poorly drained soils that have clayey subsoil and are developed on the more shaly part of the upper Shawnee Group. The central and eastern parts of the region are dissected by numerous tributaries of the three major streams flowing through the site area and have slightly steeper slopes and thinner soils, which are developed on the limestone-dominated lower part of the Shawnee. The rather shallow and weathered zones of the bedrock receive considerable recharge from direct precipitation during wet seasons, which infiltrates open joints in the limestone formations and shrinkage cracks and relief fractures in the weathered shales and sandstones. Shallow wells 5 to 60 feet deep may obtain yields of generally less than one to a few gallons per minutes from the upper weathered zones. Water in the voids and fractures in these rocks is drained by springs, seeps, and brushy vegetation at the outcrop and quickly depleted after the onset of prolonged dry periods.

The major streams, as mentioned above, cut across the outcrops of the beds and contribute recharge to the more permeable ledges and sandy layers during wet seasons and in the eastern part of their reaches, which have generally perennial flows. Beds of sandstone and sandy layers, especially in the Calhoun and Kanwaka Shale formations, contain perched or confined aquifers, which are the principal sources of water for wells in some localities. Some wells ranging from 40 to 150 feet in depth obtain enough water for domestic and stock use. Because the sandstones occur as erratic channels or lenticular beds that grade laterally into less permeable shale, availability of water is also erratic and somewhat unpredictable.

Ground water in the sandstones of the Shawnee Group is generally a sodium bicarbonate water with dissolved solids ranging from 800 to 1,400 ppm. Shallow water in the weathered zones of limestones and shales generally contains a much harder calcium bicarbonate water. Water from deeper aquifers in this region is too high in total dissolved solids for either stock or domestic use; few wells have been drilled into these aquifers.

The quality of waters produced in both Regions 3 and 4 ranges from 438 to 1,840 ppm total dissolved solids (TDS) and averages 1,089 ppm.

Region 5, in the eastern and southeastern quadrants of the collider oval, is underlain principally by shales and sandstones of the Douglas Group. The principal aquifers in the region are the Ireland Sandstone Member of the Lawrence Formation and the Tonganoxie Sandstone Member of the Stranger Formation. These sandstones are channel-filling deposits; in one area in the east quadrant of the oval the local disconformity at the base of the Ireland Member has been cut down into the Tonganoxie and the two are in direct hydraulic connection. The ground water in them intermingles both vertically and horizontally. Three subregions are delineated in Figure 3.7 based on the principal aquifer in each.

Subregion 5a, identified in the southwestern corner of Douglas County, produces ground water mainly from the Tonganoxie Sandstone, which is reported to be 120 feet thick locally. The aquifer is confined by the

overlying Vinland Shale Member of the Stranger Formation and underlying limestones of the Stanton Formation. O'Connor (1960) reports that the hydraulic gradient slopes towards the northeast at about 7 feet per mile and that part of the ground water moving downgradient in that direction discharges into the alluvial deposits of the Wakarusa and Kansas river valleys. Recharge to the Tonganoxie in that area is believed to result from hydraulic interconnection with the Ireland sandstone in Region 5b.

In the area now occupied by Clinton Reservoir, the hydraulic head of the impounded water may be locally reversing this process and contributing recharge to the Tonganoxie (Crook, 1971). No studies have been done to confirm this process.

Many wells in the Tonganoxie in this region yield 5 to 50 gpm with some locally producing 50 to 100 gpm over short periods of time.

The quality of water from the Tonganoxie in Region 5a, which is near its outcrop, is usually good but becomes saline to the west, downdip beneath the Shawnee Group cover in Region 4 and beyond. The quality also reportedly is brackish toward the discharge area in the northeast.

Subregion 5b is the area where both the Ireland and the Tonganoxie sandstones are freshwater aquifers and in some localities in northwestern Franklin County are in contact and hydraulically connected. Unless intervening beds are present, the two are difficult to differentiate except by a slightly finer texture in the Ireland and by general stratigraphic position. Where the two can be identified separately the Ireland ranges up to 100 feet and the Tonganoxie 3 to 50, but locally as much as 100 feet thick.

Unconfined or water-table conditions prevail in the eastern part of the subregion, but both aquifers are confined between less permeable units toward the west where they have a moderate potentiometric head that slopes generally westward.

Unpublished data from Macfarlane (1981) indicate a generally continuous potentiometric surface in this area, although it is difficult to determine whether wells are in the Ireland or Tonganoxie sandstones (Figure 3.8).

Wells range from 115 to 300 feet in depth. Water quality is generally good for most uses. The Ireland reportedly ranges from 514 to 8,490 ppm TDS with an average of 2,377 ppm; the Tonganoxie from 565 to 3,390 ppm, averaging 1,866 ppm.

Subregion 5c produces water principally from the Ireland Sandstone Member of the Lawrence Formation. The unit is widely distributed and has maximum reported thicknesses of 60 to 90 feet. The Ireland is a confined aquifer in this area. Wells in Osage County that tap the Ireland range in depth from 80 to 350 feet. Yields range from 1 to 40 gpm.

Quality ranges from soft sodium bicarbonate waters to a somewhat harder calcium bicarbonate. The amount of chlorides in some wells is enough to give the water a salty taste.

The western boundary of Region 5c is approximate. West of it the water in the Ireland is too highly mineralized for either domestic or stock use.

3.3.2 Water Resources for the SSC Facility

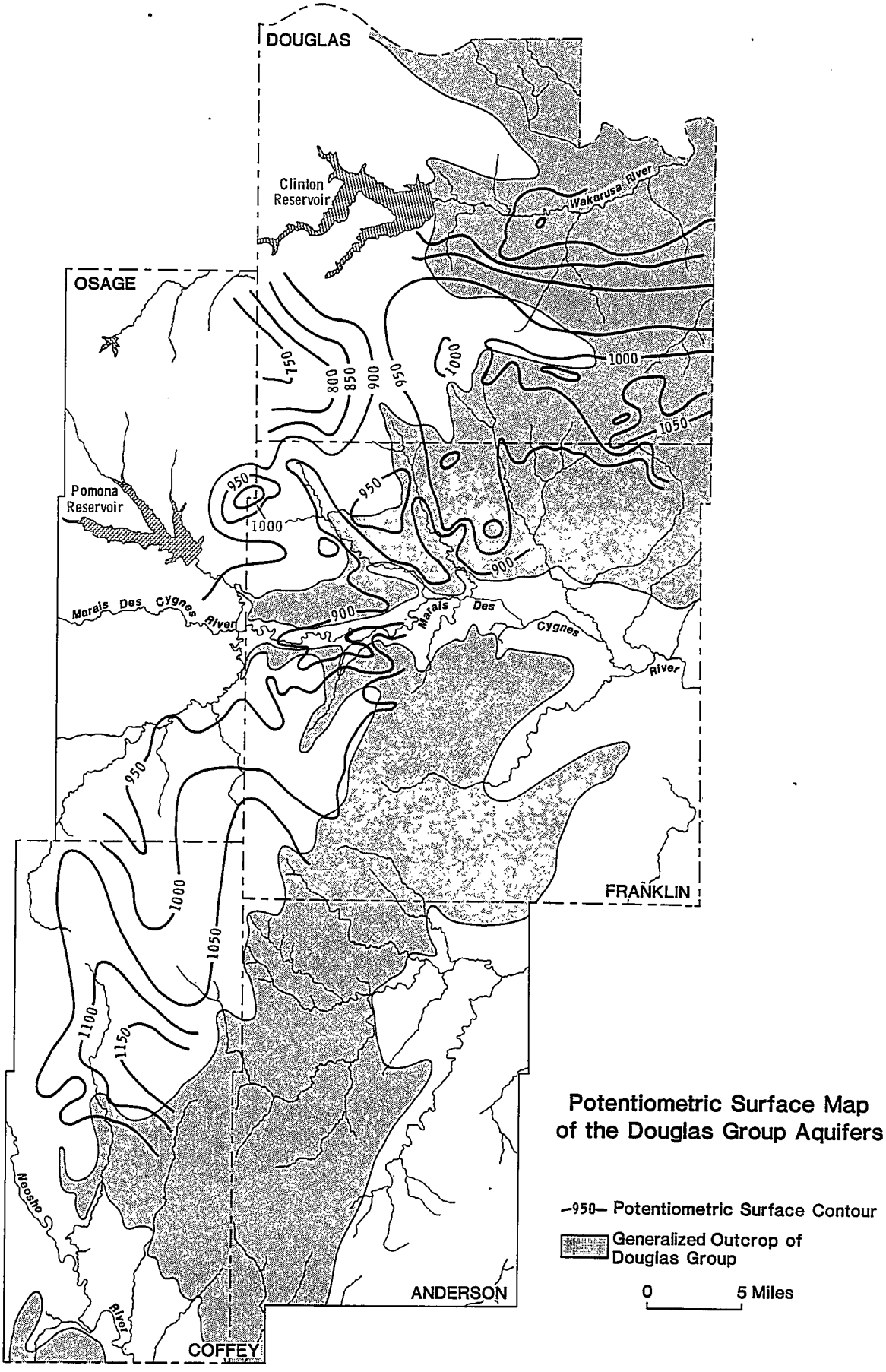
Primary supply of water for the proposed Kansas site will be treated water from the City of Topeka. It will be drawn from the Kansas River, from which an assured supply will be maintained during periods of even maximum drought by contracts with the Kansas Water Office for releases from upstream reservoirs operated by the U.S. Army Corps of Engineers. Delivery to the site will be by new 15-inch pipeline from Topeka. An optional source is present in Pomona Lake for which the Kansas Water Office also has contracts with the U.S. Army Corps of Engineers.

It is presumed that a limited water supply for outlying installations will come from existing rural water districts.

In the event any small wells are used to supply outlying areas, such use would be subject to ground-water-quality standards promulgated by the Kansas Department of Health and Environment (KSA 65-171m, 28-15), effective May 1, 1982. These are primary drinking-water standards that apply to domestic use (public water supply). Kansas uses the U.S. EPA 1976 Water Quality Criteria for recommended secondary standards. There are no special water-quality areas within the SSC area that would require anything other than these normal criteria.

Municipal water supplies to small cities, towns, and rural water districts in the vicinity of the proposed site are not expected to be affected by or to affect construction of the SSC facility. Surface subsidence caused by groundwater withdrawal by local users is not known and is

FIGURE 3.8—POTENTIOMETRIC-SURFACE MAP OF THE DOUGLAS GROUP AQUIFERS (FROM MACFARLANE, 1981; FACING PAGE).


DOUGLAS
Clinton Reservoir
Wakarusa River
OSAGE
Pomona Reservoir
Marais Des Cygnes River
Marais Des Cygnes River
FRANKLIN
ANDERSON
COFFEY
Neosho River
150
800
850
900
950
1000
1050
1100
1150
Potentiometric Surface Map of the Douglas Group Aquifers
950 Potentiometric Surface Contour
Generalized Outcrop of Douglas Group
0
5 Miles

unlikely because of the competent nature of the bedrock and because the SSC is not located in thick unconsolidated or alluvial deposits at any place on the collider alignment.

3.3.3 Locations where Underground Construction May be Affected by Ground Water

The quantities of ground water described in Section 3.3.1 are from both small-diameter (5-10-inch) drilled wells with variable lengths of exposed section or screened areas and from older large-diameter (3-5-feet) dug wells that usually have a variable depth of reservoir dug out below the thin contributing aquifer (as at the contact between the soil or weathered shale zone or at the base of a limestone) into an underlying, less permeable shale unit in the manner of a cistern. Few of the wells reported had actual supervised pumping tests performed.

The maximum quantities of water reported from bedrock wells was 100 gpm from small-diameter wells into the Tonganoxie or combined Ireland-Tonganoxie aquifer. O'Connor (personal communication) emphasizes that the 50 to 100 gpm reported yields are short term and that long-term observation and performance of such wells (as in the vicinity of Overbrook and its well field) is much less. The static and pumped-water levels in these wells has also dropped substantially during their operation. For example, in Overbrook Municipal well No. 1, the static water level has dropped 156 feet between 1953 and 1979, indicating that the aquifers are being depleted.

The Tonganoxie aquifer itself will not be encountered in the collider tunnel or shafts, but its potentiometric surface rises above the level of the collider tunnel elevation in some of the area and may be encountered in the vicinity of any undetected faults that might be present in the confining layers above it. The faults that have been observed in the area do not have extensive gouge-filled zones and are usually tightly closed, so such occurrences, if encountered at all, will be in a very narrow zone and quickly penetrated by the TBM. Water quality and pressure will not be great, and the flow will only occur until the length of the TBM penetrates through the zone and liner is placed and grouted.

The Ireland sandstone aquifer and the upper part of the combined Ireland-Tonganoxie, where the units are in contact and hydraulically connected, will likely be penetrated by the collider tunnel and lower parts of shafts between and in the vicinity of shafts E2 to E5. In the vicinity of the Overbrook well field, which is 2 to 3 miles northeast of E2, the Ireland is reported to be about 80 feet thick and the yield from drilled wells in that interval was 6 to 12 gpm. In a well drilled at the Pomona Lake headquarters office at the south abutment of the dam about three miles northwest of F4, water was encountered in the Jackson Park Shale Member of the Kanwaka Formation and reported at 2.5 gpm with 666 ppm chloride. The Plattsmouth Limestone Member of the Oread Formation reportedly produced 4 gallons per hour. The Ireland sandstone reportedly produced 10 gpm from unspecified sections of its 65-feet thickness. Chloride content in the Ireland ranged from 21,200 ppm to 29,050 at a depth of 308 feet. Elevation of the static water level in the well (presumably from all formations penetrated) was 916 feet msl (mean sea level). In this well the Ireland and Tonganoxie were not connected, and the interval between them consisted of about 70 feet of sandy shale with about 10 feet of sandy limestone (probably the Haskell) and 10 feet of clayey to silty shale. The Tonganoxie was 40 feet thick and produced 22 gpm of salty water (41,000 ppm chloride).

From these and other observations in the area (O'Connor, H. G., Kansas Geological Survey, personal communication; Carlson, D. R., Kansas Department of Health and Environment, personal communication; and Jungmann, J., personal communication), it is concluded that the maximum amount of water likely to be encountered by a 12-foot-diameter TBM drilling full face in the Ireland aquifer is 27 gpm per linear foot. The pressures will be low (see Table 3.1).

Other higher water-bearing zones likely to be encountered in the collider or injector complex tunnels or in shafts will occur from rock joints and formational contacts between units in the alternating limestone-shale sequences, which are relatively narrow zones. Maximum water yields reported from such occurrences were 10 gpm; these were from moderate to shallow depths, so head pressures will be minimal. At depths below 100 feet, the units contain little water.

Ground water may be expected from sandstone bodies in several of the thicker shale units between the limestone-shale formations. It is generally from thin sandstone bodies or lentils in the shales and is not laterally continuous in most instances. Maximum quantities are 20 gpm or less, and head pressures will be moderate to low. Most of the limestone-shale and alternating thicker shale units described above will only be encountered in shaft sinking and at shallower depths (in the weathered zone).

TABLE 3.1—PERMEABILITIES OF BEDROCK WITHIN A 5-MILE RADIUS OF WOLF CREEK GENERATING STATION.

Rock Units and Age	Permeability (gpd/ft^2)
Jackson Park Shale	9.33×10^{-1}
Kereford Limestone	4.03×10^{-1}
Heumader Shale	1.27×10^{-1}
Plattsmouth Limestone	4.87×10^{-2}
Heebner Shale	2.12×10^{-2}
Leavenworth Limestone	7.84×10^{-3}
Snyderville Shale	2.33×10^{-2}
Toronto Limestone	2.54×10^{-2}
Unnamed Shale	3.82×10^{-2}
Amazonia Limestone	2.12×10^{-3}
Ireland Sandstone	1.76×10^{-1}
Robbins Shale	5.51×10^{-3}
Haskell Limestone	4.45×10^{-3}
Vinland Shale	6.36×10^{-2}
Westphalia	1.02×10^{-2}
Tonganoxie Sandstone	5.94×10^{-3}
Iatan Limestone	---
Weston Shale	1.95×10^{-3}
South Bend Limestone	8.06×10^{-4}

Source: Wolf Creek Generating Station Environmental Report, Volume I, Table 2.5-4.

Alluvial materials will not be encountered in either the tunnels or shafts. Permeabilities (or hydraulic conductivities) of units in the immediate area of the proposed SSC facility are not readily available for all rock units. O'Connor (1960) rated several values for the Ireland sandstone and the Tonganoxie sandstone within and nearby the SSC area. These are shown below:

Geologic Unit	Transmissivity (gpd/ft)	Permeability (gpd/ft^2)	Storage
Ireland	6,861	343	
"	4,258		
"	5,280	126	
Tonganoxie	1,620	18	5×10^{-5}

Laboratory tests performed on a core of Tonganoxie sandstone taken from a well at NWNESE sec. 2, T. 13 S., R. 19 E. yielded a permeability of 10.8 gpd/ft^2 (McClain, 1985).

Permeabilities of bedrock units within a 5-mile radius of the Wolf Creek Generating Station (WCGS), a nuclear power plant near Burlington (Coffey County) about 30 miles south of the proposed SSC project, are listed in Table 3.1.

Other or additional data including field permeabilities from pressure-loss and field-permeameter tests of selected rock units at WCNGS are cited in Section 3.5.2.

As described in Section 3.3.2, the quality of water likely to be encountered will range from relatively fresh near the surface and near the outcrop, through brackish at moderate depths, to salty at greater depths below the surface and at increasing distances downdip from the outcrop. Table 3.2 summarizes well-water quality data on file at the Kansas Geological Survey and Kansas Department of Health and Environment. Stiff diagrams of water qualities for the same wells are shown in Figure 3.9.

Methods for disposing of the encountered water, whether fresh or mineralized, are described in Section 3.5.5. The corrosive effects of mineralized water contained in the rocks on tunnel-drilling equipment and lining materials depends on length of exposure, chemical composition and concentration, and, in the case of lining materials, their own composition. Except in the deepest and westernmost areas of the oval, this will not be a problem, but it should be investigated more thoroughly in the pre-design stage.

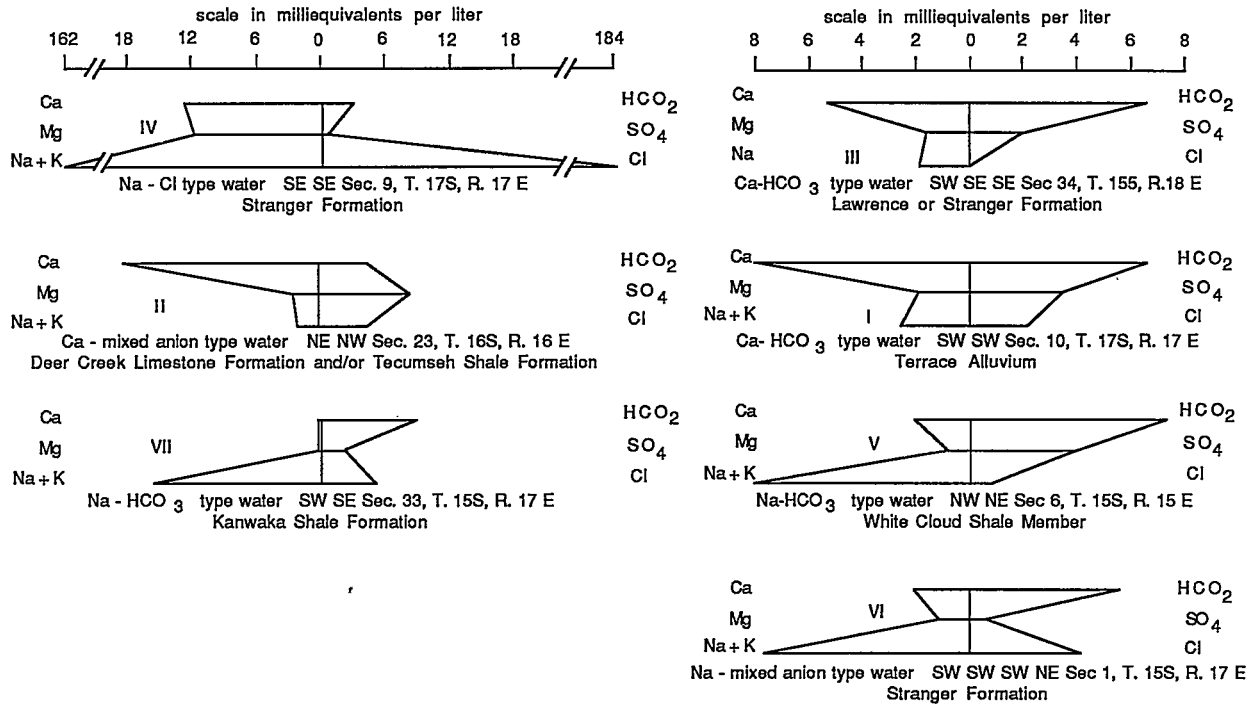


FIGURE 3.9—STIFF DIAGRAMS SHOWING REPRESENTATIVE WELL-WATER QUALITIES FOR AQUIFERS IN THE SSC SITE AREA.

The swelling or slaking characteristics of some units are described in Section 3.5.2 on rock mechanics but this also should be studied more fully with respect to all units in the pre-design investigation stage.

In summary, no exceptional problem areas or features of the geohydrology of the proposed site are known; none is expected. The minor problems are of the type expected on any underground project of this scope and can be managed rather routinely in design, construction, and operation of the proposed facility.

TABLE 3.2—ANALYSIS OF WATER FROM TYPICAL WELLS, TEST HOLES, AND SPRINGS IN SSC AREA. Dissolved constituents given in parts per million (ppm).

Well Location	Well Depth (feet)	Geologic Source	Date of Collection	Dissolved Solids	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)
V NW NE 6-15-15E	200	White Cloud sh	5-11-52	672	7.2	0.67	45	13
II NE NW 23-16-16E	25.1	Deer Creek ls and/or Tecumseh sh	7-17-52	1,380	2.2	0.91	340	31
I SW SE 10-17-17E	33	Terrace Alluvium	9-10-52	824	16	0.11	159	23
VI SW NE 1-15-17E	497	Stranger Formation	12-12-55	565		0.32	38	12
III SE SEE 34-15-18E		Lawrence sh or Stranger Fm.	9-13-84			0.18	104	18.50
IV SE SE 9-17-17E	228	Stranger Fm	2-25-43	11,700	9.2	4.3	259	141
VII SW SE 33-15-17E	110	Kanwaka	7-17-52	875	7.6	0.07	4.5	2.8

Well Location	Sodium & Potassium (Na & K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Hardness as $CaCO_3$ Total	Carbonate	Noncarbonate
V NW NE 6-15-15E	188	423	170	24	1.0	15	166	166	0
II NE NW 23-16-16E	47	252	382	184	0.3	266	976	206	770
I SW SE 10-17-17E	55	359	143	60	0.2	102	491	294	197
VI SW NE 1-15-17E	173	346	31	144	0.7	0.4	144	144	0
III SE SEE 34-15-18E	39*		95	1.7	0.29	0.01	336	326	10
IV SE SE 9-17-17E	3,720	146	0	6,510	2.4	8.4	1,220	120	1,110
VII SW SE 33-15-17E	342	517	81	179	1.5	2.0	22	22	0

*Sodium concentration only
From: O'Connor (1955), table 4, p. 32-33.
Analysis from files of the Kansas Department of Health and Environment

3.4 SEISMICITY AND FAULTING

Earthquake risk near the site is minimal as discussed below. Figure 3.10, excerpted from Algermissen and Perkins (1976), shows that there is a 90 percent chance that horizontal acceleration at the site due to earthquake will not exceed 11 percent of gravity during a period of 50 years. Their data were based upon historical seismicity prior to 1975.

3.4.1 Characterization of Site Seismicity

Recent microearthquake studies by the Kansas Geological Survey support the conclusions of Algermissen and Perkins (1976) but provide additional details about actual locations of seismicity trends. In particular, four trends of microearthquake epicenters contain over 95% of the earthquake energy for the period 1977-1987. The trend nearest the site is along the Humboldt fault zone which runs south-southwestward from the southeastern tip of Nebraska through Kansas into central Oklahoma. The largest earthquakes along this trend during the past 10 years had magnitudes of less than 3.0 M_{blg} (Figure 3.11).

The largest historic earthquake along the Humboldt fault zone in Kansas occurred in 1867, reaching Modified Mercalli Intensity VII in alluvial river valleys over a substantial area, but with only MM Intensity VI on bedrock near the site (Dubois and Wilson, 1978). The historic earthquakes of Kansas, Nebraska, western Iowa, and western Missouri are plotted on Figure 3.12.

The other microearthquake trends that are present in Figure 3.11 include a trend parallel to, but about 80

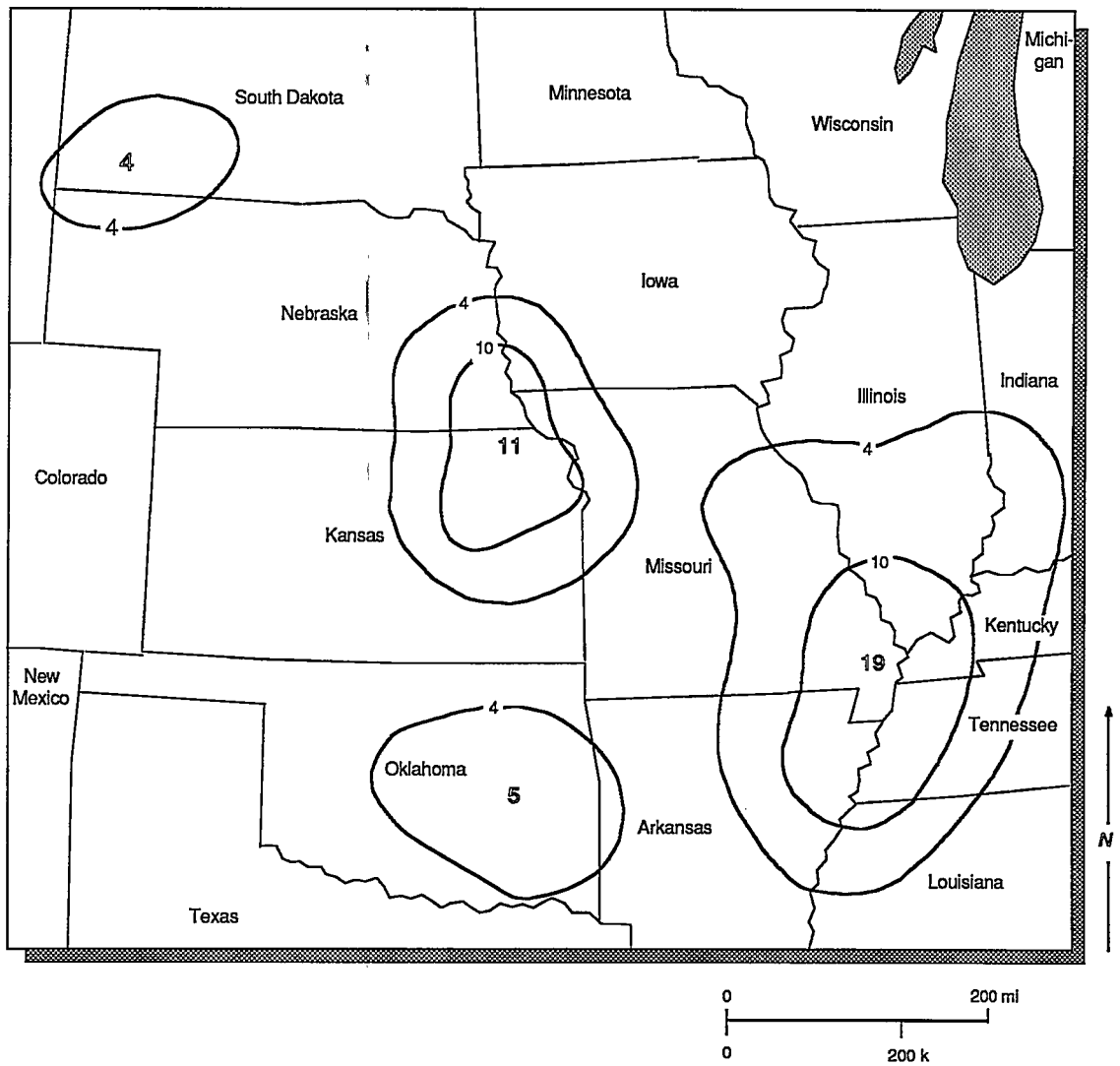


FIGURE 3.10—MIDCONTINENT PORTION OF THE U.S. GEOLOGICAL SURVEY EARTHQUAKE RISK MAP OF THE UNITED STATES (ALGERMISSEN AND PERKINS, 1976).

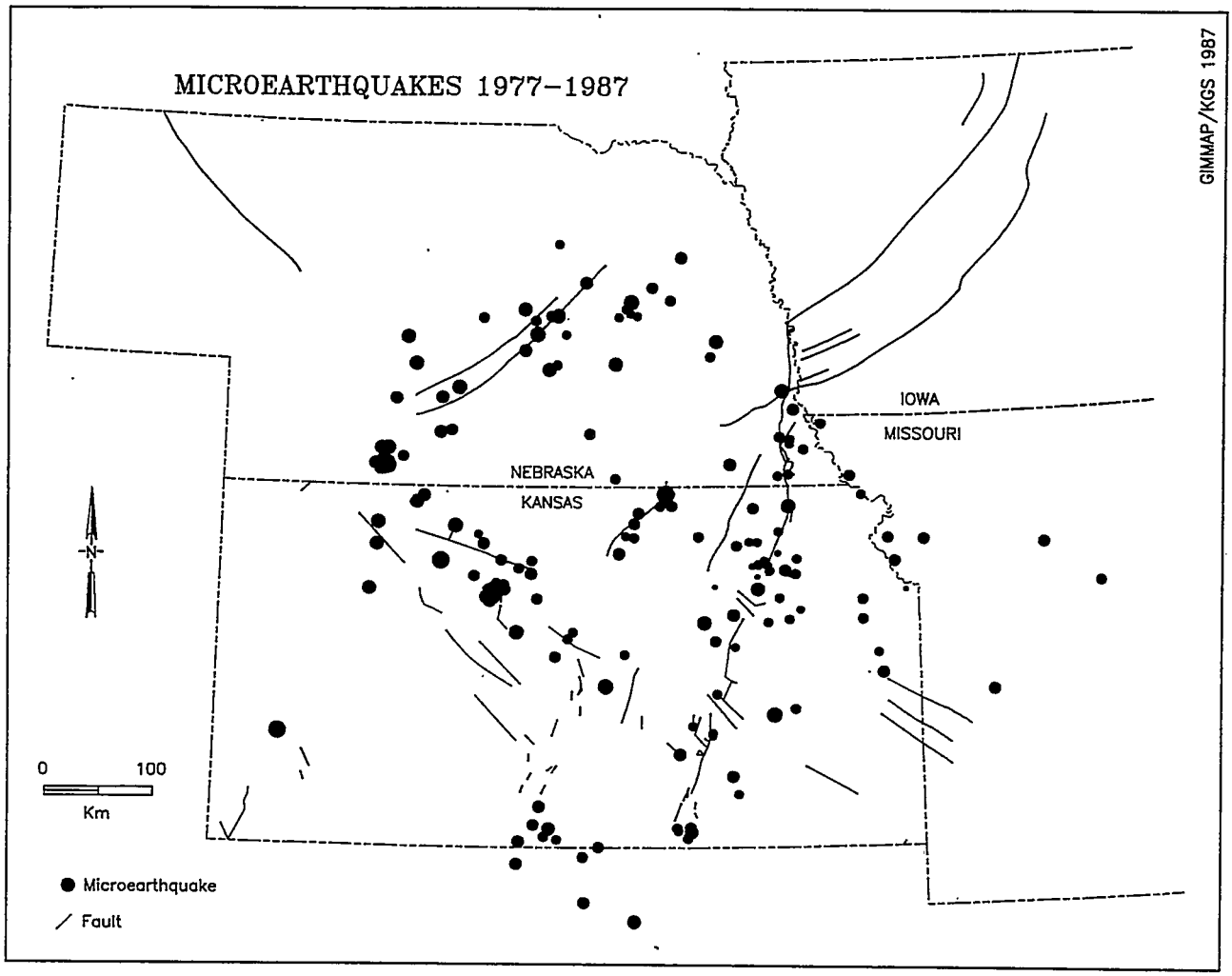


FIGURE 3.11—TRENDS OF EARTHQUAKE ACTIVITY RECORDED BY THE KANSAS GEOLOGICAL SURVEY'S REGIONAL SEISMIC NETWORK SINCE ITS INSTALLATION IN LATE 1977.

miles west of, the Humboldt fault zone, a northwestward trend from central Kansas to the Nebraska border, and a northeastward trend in Nebraska extending across central Nebraska.

3.4.2 Ground Acceleration

In summary, the site is relatively safe from seismic risk. Extensive regional microearthquake studies by the Kansas Geological Survey have been done in the area during the past 10 years using a microearthquake network whose configuration is shown in Figure 3.13. Probabilistic estimates of ground shaking by Algermissen and Perkins (1976) suggest horizontal accelerations are not likely to exceed 11 percent of gravity during the life of the SSC facility.

3.4.3 Faults in Site Vicinity

Surface faults in the site area were discussed in Section 3.2.3. All were shown to be ancient. The nearest post-Pleistocene surface faulting is about 350 miles from the site at two locations. The Meers fault in west-central Oklahoma was the site of surface faulting from an earthquake of roughly magnitude 7 about 2,000 years ago (Crone and Luza, 1986). The New Madrid, Missouri, area experienced surface faulting in 1811 and 1812 (Russ, 1982). Neither of these earthquakes likely caused shaking above MM Intensity VII at the proposed site.

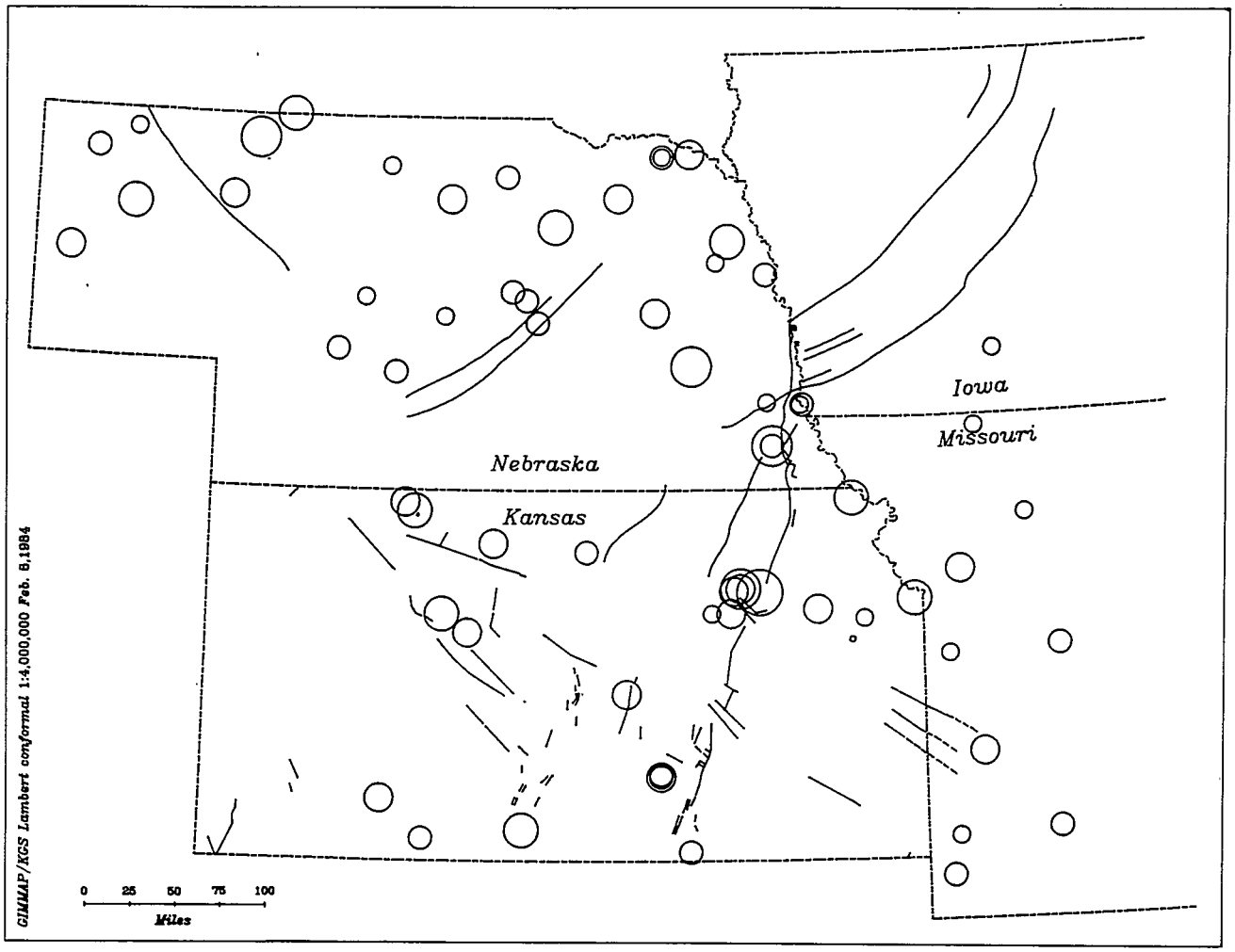


FIGURE 3.12—LOCATIONS AND MM INTENSITIES OF EARTHQUAKES IN THE REGION DURING THE PERIOD 1867-1977. Largest diameter circles equal MM VII.

3.4.4. Potential for Liquefaction

The saturated alluvial materials in the stream valleys crossing the site have a high percentage of silty clay with a relatively small admixture of sand and gravel. The proposed facility will be located entirely in or on bedrock. Liquefaction is not a factor in the design of any of its structures.

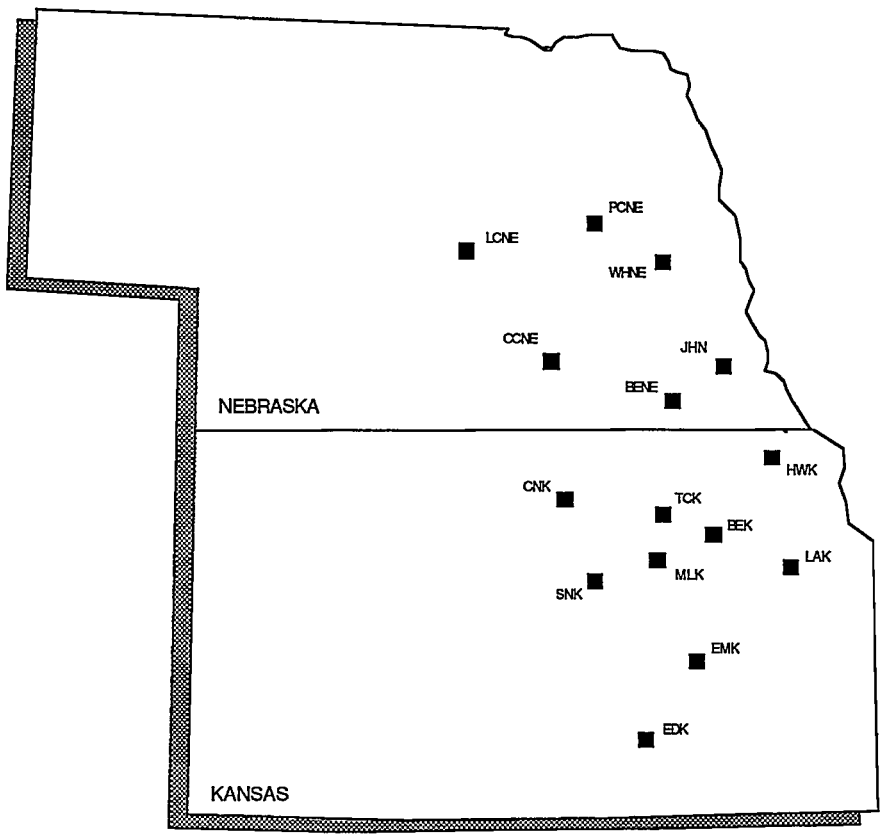


FIGURE 3.13—LOCATIONS AND IDENTIFICATIONS OF STATIONS IN THE KANSAS GEOLOGICAL SURVEY'S SEISMIC NETWORK.

3.5 TUNNELING AND UNDERGROUND CONSTRUCTION

The following general assumptions guided the choice of the Kansas site, tunneling media, and suggested methods of excavation and construction. They are based on knowledge of conditions at the site, parameters of the collider complex from DOE conceptual-design documents, and judgments about the best application of current equipment, concepts, and practices to carry out construction of the project to specifications in minimum time and at low cost. It was assumed that excavation of the tunnels will be done with soft-rock tunnel-boring machines (TBMs) of recent design with proven capabilities. It was also assumed (prior to the CDG's choice of the same method for their conceptual soft-rock tunneling design and estimate) that pre-cast, reinforced-concrete, segmented liner will be installed immediately behind the tunnel-machine shield and that the TBM would be advanced by hydraulically jacking against the in-place liner rather than using wall-rock friction. It is further assumed that the tunneling and underground construction will be divided into segments under several contracts and that some will be under construction at the same time, so proper sequencing of operations will be necessary and important.

3.5.1 Relevant Soil and Rock Units

A detailed description of the geologic formations is given in Section 3.2.3. Geologic profiles, Plates 3.3 (north) and 3.3 (south) (in map tube), show where various units will be encountered in surface and underground construction at the proposed site. General geologic structure and finer structure including faults, joints, rock-mass quality, and orientation were described in Section 3.2.3. Possible problem areas and situations were described in Section 3.2.4.

3.5.2 Physical and Mechanical Properties of the Units Likely to be Utilized or Excavated

Available rock mechanics and other pertinent data for most of the units to be involved at the proposed SSC

TABLE 3.3—UNCONFINED COMPRESSIVE STRENGTH OF BEDROCK UNITS REPORTED FROM PROJECTS NEAR THE SITE.

Bedrock Unit	Rock type	Clinton				Pomona				Melvern				Wolf Creek			
		# of tests	Max	Min	Avg	# of tests	Max	Min	Avg	# of tests	Max	Min	Avg	# of tests	Max	Min	Avg
Calhoun Fm	Sh									3	127	67	94				
Deer Crk Fm	Sh&Ls																
Ervine Crk Mbr	Ls									0							
Larsh-Burrock Mbr	Sh									1			74				
Rock Bluff Mbr	Ls									0							
Oskaloosa Mbr	Sh									3	76	12	46				
Ozawkie Mbr	Ls									11	643	10	279				
Tecumseh Fm	Sh&Ls									15	1197	1	417				
Deer Creek Fm																	
Avoca Mbr	Ls									3	1234	564	967				
King Hill Mbr	Sh									9	796	71	207				
Beil Mbr	Ls					1			324	4	1036	490	766				
Queen Hill Mbr	Sh					1			154	1			237				
Big Springs Mbr	Ls									2	1505	478	992				
Doniphan MBr	Sh					8	51	1.5	15	19	393	3	100				
Spring Branch Mbr	Ls					6	423	11	300	1			1192				
Kanwaka Fm	Sh, Ls & SS																
Stull Mbr	Sh					5	138	24	53	4	143	4	72				
Clay Crk Mbr	Ls					1			603	3	1392	629	913				
Jackson Park Mbr	Ss					9	338	31	98	14	402	12	167	2	167	160	163
Oread Fm	Ls&Sh																
Kereford Mbr	Ls					6	590	288	500								
Heumader Mbr	Sh					17	66	8	27.5					6	22	4	10
Plattsmouth Mbr	Ls	4	351	172	277	14	810	356	615					10	1184	387	609
Heebner Mbr	Sh	3	154	126	140	13	338	37	181					5	181	51	105
Leavenworth Mbr	Ls	1			950	3	370		250					6	1059	490	732
Snyderville Mbr	Sh	5	29	3	15	10	93	17	41					6	96	6	24
Toronto Mbr	Ls	7	516	154	290									8	1243	175	566
Lawrence Fm						5	56	22	36					2	15	9	12
Unnamed Mbr	Sh		193	2	32									2	128	11	69
Amazonia Mbr														3	317	8	175
Ireland Mbr	Ss													5	158	12	65
Robbins Mbr	Sh													3	140	29	85
Haskell Mbr	Ls		784	635	710									1			895
Stranger Fm																	
Vinland Mbr	SS & Sh	4	134	29	81									2	215	156	185
Tonganoxie Mbr	Ss	1			35									4	201	90	159
Weston Mbr														1			90

*In tons (2000 lbs) per square foot (tsf)

project were compiled from U.S. Army Corps of Engineers (Corps) Design Memoranda and Preliminary Safety Analysis Reports for four major projects located nearest the proposed site. These are 1) Clinton Dam, about 20 miles northeast, near Lawrence; 2) Pomona Dam, inside the collider oval near its southeast quadrant; 3) Melvern Dam, located about 5 miles southwest (all projects of the Kansas City District, U.S. Army Corps of Engineers); and 4) Wolf Creek Generating Station, a nuclear power plant located about 30 miles south (tests and reports by Dames & Moore).

Table 3.3 summarizes the unconfined compressive strengths (UCS) of the bedrock units occurring at the listed sites, with the Wolf Creek data averaged and converted to tons (2,000 lbs) per square foot (TSF) and listed in the same format as the Corps data (note that unlike the geologic descriptions given in previous sections, these data are listed from youngest to oldest, or in drill-hole order).

Comparison of the values given for units that occur at two or more of the projects shows a range, so all values should be considered with caution. The tested cores from the Corps projects were taken from unweathered rock occurring in or near the abutments of the dams at relatively shallow depths and possibly within the zone of relaxation near the valley walls. Thus for the shales, at least, the values may be low compared to those likely to be encountered in the tunnels at the proposed SSC site.

The actual sources of data from the four projects are reproduced in Tables 3.4 through 3.7 . Other useful test data are included in these tables: dry weight; percent moisture content; and slaking durability (from cycles of wetting and drying) are included in the same tables with the compressive stress data from the Corps projects. Tables 3.8 through 3.11 are test results from the Wolf Creek Project listing, respectively: wet densities; swelling pressures of shale units; clay mineralogy and slaking tests for shales; and field permeabilities from pressure-loss and field-permeameter tests of selected units. Rock-mechanics data for units above the Calhoun Shale are not available. Descriptions and data for major soils occurring in the areas of the north and south clusters, where most surface excavations will take place, are summarized from the U.S. Department of Agriculture, Soil Conservation Service Soils Report and maps for Osage County (volume 3, appendix). These units will occur at or near the surface and in the upper parts of shafts.

3.5.3 Advantages and Difficulties Presented by Site Geologic Units

Unconfined compressive strengths of all the geologic units are generally lower than values for limestone, sandstone, and shale alone or in combination, compared to the values used by the SSC Central Design Group in its conceptual design and cost-estimate calculations. This reflects the fact that their data were derived from tests of similar rocks in geographic areas where the strata have been subjected to higher tectonic stresses and/or deeper burial. All of the lithologies or rock types at the Kansas proposed site, alone or in combination, appear to be capable of easy excavation by TBMs or other rapid-excavation methods at average advance rates greater than those estimated by the CDG in its conceptual design and analysis.

The relatively lower strengths of the units, larger proportion of shales, and the relative thinness of the more competent limestone units at the Kansas site present problems in the design and construction of the larger underground chambers, such as the collider halls and adjacent preparatory chambers. Some conceptual suggestions as to how these can be addressed are discussed in the following sections, but comprehensive and detailed solutions require more information than was presented in the conceptual design documents and the Invitation for Site Proposal (ISP).

3.5.4 Recommended Construction Techniques

Recommended construction methods, suggested changes in sequencing of operations to take advantage of special situations at the proposed site, and possible techniques for amelioration of problems associated with the design and construction of the large underground chambers are outlined below.

Machine boring of the main tunnel segments is recommended. The physical and mechnical properties of the rocks to be encountered are such that a number of available TBMs will be suitable to do the work. Local experience suggests, however, that TBMs that utilize jacking pads that press into the wall rock of the tunnel to advance the machine have experienced problems because of slippage due to shearing of the resisting material in the walls, especially in shales. TBMs that jack against in-place tunnel lining are recommended. Pre-cast, reinforced-concrete liner segments are recommended for that reason and also because they are faster to install, less expensive, and can be produced locally. Six modern cement plants are located within 100 miles of the site and sources of aggregate are abundant. Ready-mix and casting plants capable of producing high-quality structural elements also are present or a special casting plant could be constructed on or near the site.

Short connecting segments, short-radius tunnels, special cross sections, and other similar underground construction should be done with mechanized excavation equipment such as tracked or tire-mounted, swing-arm, rotary-headed cutters (road headers). Modified jumbo-mounted coal saws, undercutters, long-wall jacks, and

TABLE 3.4—BEDROCK TEST DATA, CLINTON DAM PROJECT.

		Unconfined compression *tons/ft2*				Dry weight *lbs/ft3*		Moisture content *% dry weight*		Wetting-Drying Average		
Bedrock Unit	**Rock type**	**No. tests**	**Avg.**	**Max.**	**Min.**	**No. tests**	**Avg.**	**No. Tests**	**Avg.**	**No. tests**	**% Loss**	**Cycle**
Plattsmouth	ls	4	277	351	172	4	153	4	2.8			
Heebner	sh	3	140	154	126	4	123	4	8.2	4	100	1.5
Leavenworth	ls	1	950			1	169	1	1.0			
Snyderville	sh	5	15.1	29.2	2.6	5	126	5	12.4	6	100	1
Toronto	ls	7	290	516	154	8	158	8	3.2	2	0	20
Lawrence												
Zone A	sh	19	24.0	85.3	2.1	20	132	20	11.0	22	100	1
Zone B	sh	44	40.7	193	2.0	44	138	44	9.1	45*	100	1
Haskell	ls	2	710	784	635	2	167	2	2.0			
Vinland	ss	2	133	134	131	2	145	2	8.0			
	sh	2	29.1	34.1	24.1	2	146	2	8.0	2	100	1
Tonganoxie	sh	1	35.2			1	142	1	9			

*One sample of sandstone with shale partings had no loss in 20 cycles.

TABLE 3.5—POMONA DAM PROJECT, DAM SITE AVERAGE TEST RESULTS.

Member	Vertical compression $tons/ft^2$ No of Tests	Avg.	Max.	Min.	Dry weight lbs/ft^3 No. of Tests	Avg.	Moisture Content % Dry Weight No. of Tests	Avg. %	$MgSO_4$ (5 cycles) No. of Tests	Avg. % Loss
Beil ls	1	324			1	160	1	2.0		
Queen Hill shale	1	154			1	117	1	8.0		
Doniphan shale	8	15	51	1.5	8	130	1	12.0		
Spring Branch ls										
Zone A	2	257	423	100	2	151	2	4.5		
Zone B	2	12	13.5	11	2	130	2	12.0		
Zone C	1	632			1	165	1	0.5	1	0.40
Stull shale	5	53	138	24	5	135	5	9.6		
Clay Creek ls	1	603			1	166	2	3.6		
Jackson Park shale	9	98	338	31	9	140	9	7.4		
Kereford ls	6	500	590	288	7	162	8	3.0	3	13.93
Heumader shale	17	27.5	66	8	19	134	19	9.9		
Plattsmouth ls	14	615	810	356	14	158	14	3.2	9	3.77
Heebner shale	13	181	338	37	13	132	14	6.8		
Leavenworth ls	3	250	370	91	3	158	3	1.6		
Snyderville shale	10	41	93	17	13	144	13	7.7		
Lawrence shale	5	36	56	22	5	136	5	7.7		

TABLE 3.6—RESULTS OF UNCONFINED COMPRESSION TESTS ON ROCK CORE SAMPLES, WOLF CREEK GENERATING STATION PROJECT.

Boring	Geologic Unit and Lithology	Depth (feet)	Elevation (feet)	Unconfined Compressive Strength (psi)	Static Modulus of Elasticity* times 10^{-6} (psi)	Poisson's Ratio*	Bulk Modulus times 10^{-6} (psi)
P-6	Jackson Park Sandstone	7.4	1099.2	2,220	0.382	10.31	0.34
P-9	Jackson Park Sandy Siltstone	9.9	1094.6	2,330	0.323	0.30	0.27
P-11	Heumader Shale	25.3	1078.1	69	0.00182	0.37	0.0023
B-4	Heumader Shale	22.9	1075.1	300	0.0343		
P-4	Heumader Shale	36.3	1069.3	56	0.00104	0.42	0.0022
P-9	Heumader Shale	35.8	1068.7	131	0.00553	0.40	0.0092
ESW-12	Heumader Shale	17.8	1072.8	161	0.0914	0.42	
ESW-12	Heumader Shale	30.0	1060.6	103	0.0764	0.43	
P-9	Plattsmouth Limestone	43.1	1061.4	8,600	5.93	0.29	4.7
HS-28	Plattsmouth Limestone	33.0	1058.8	6,690	9.26	0.27	
HS-29	Plattsmouth Limestone	34.2	1057.2	11,420	8.59	0.22	
B-4	Plattsmouth Limestone	43.9	1054.6	9,300	9.59		
P-12	Plattsmouth Limestone	48.0	1054.2	7,350	3.80	0.23	2.3
B-5	Plattsmouth Limestone	41.5	1052.4	16,440	9.028		
P-6	Plattsmouth Limestone	49.5	1051.1	9,340	10.3	0.22	6.1
HS-28	Plattsmouth Limestone	42.8	1049.0	5,380	4.78	0.29	
ESW-12	Plattsmouth Limestone	46.9	1043.7	5,970	4.571	0.34	
ESW-25	Plattsmouth Limestone	4.0	1066.4	4,040	4.0	0.27	
P-11	Heebner Shale	55.1	1048.3	1,460	0.0968	0.29	0.077
B-4	Heebner Shale	50.3	1048.2	1,490	0.375		
HS-28	Heebner Shale	45.5	1046.4	1,110	0.110	0.30	
ESW-23	Heebner Shale	46.1	1046.7	710	0.7676	0.39	
ESW-25	Heebner Shale	11.3	1059.1	2,520	2.353	0.37	
P-6	Leavenworth Limestone	55.6	1051.0	10,070	7.080	0.25	4.7
P-9	Leavenworth Limestone	57.4	1047.1	6,840	5.29	0.28	4.0
P-12	Leavenworth Limestone	55.4	1046.8	6,800	7.56	0.26	5.2
HS-28	Leavenworth Limestone	47.9	1044.0	10,910	8.43	0.24	
HS-29	Leavenworth Limestone	49.0	1042.4	11,710	9.89	0.16	

TABLE 3.6—continued

Boring	Geologic Unit and Lithology	Depth (feet)	Elevation (feet)	Unconfined Compressive Strength (psi)	Static Modulus of Elasticity* times 10^{-6} (psi)	Poisson's Ratio*	Bulk Modulus times 10^{-6} (psi)
ESW-25	Leavenworth Limestone	12.6	1057.8	14,710	11.538	0.23	
P-12	Snyderville Shale	57.5	1044.7	93	0.00402	0.35	0.0045
B-5	Snyderville Shale	54.9	1039.0	1,330	0.323		
HS-29	Snyderville Shale	52.6	1038.9	175	0.0127	0.32	
P-9	Snyderville Shale	65.9	1038.6	90	0.00360	0.36	0.0043
HS-28	Snyderville Shale	56.3	1035.6	151	0.014	0.31	
ESW-25	Snyderville Shale	14.5	1055.9	176	0.1037	0.39	
B-4	Toronto Limestone	67.6	1030.9	17,260	10.9		
P-6	Toronto Limestone	75.8	1030.8	9,120	6.32	0.27	4.6
B-5	Toronto Limestone	63.7	1030.2	13,390	8.59		
HS-29	Toronto Limestone	61.8	1029.6	2,910	0.857	0.30	
HS-28	Toronto Limestone	63.8	1028.0	6,760	3.85	0.24	
P-12	Toronto Limestone	77.8	1024.4	2,430	0.526	0.32	0.49
P-9	Toronto Limestone	86.2	1018.3	5,580	3.73	0.28	2.8
ESW-25	Toronto Limestone	35.6	1034.8	5,390	4.095	0.31	
B-7	Unnamed Lawrence Shale	99.2	999.3	1,780	1.17		
P-9	Unnamed Lawrence Shale	109.9	994.6	147	0.00867	0.38	0.012
ESW-25	Lawrence Shale	48.9	1021.5	125	0.0694	0.42	
ESW-25	Lawrence Shale	63.2	1007.2	210	0.14	0.39	
P-9	Amazonia Limestone	114.9	989.6	4,410	3.15	0.30	2.6
ESW-25	Amazonia Limestone	70.2	1000.2	2,750	2.095	0.35	
ESW-25	Amazonia Shale	71.2	999.2	118	0.064	0.44	
B-6	Ireland Shale	149.1	979.3	290	0.0303		
ESW-25	Ireland Shale	78.6	991.8	169	0.1007	0.43	
P-9	Ireland Siltstone	141.8	962.7	178	0.00623	0.36	0.0074
B-4	Ireland Siltstone	184.5	914.0	1,680	0.438		
B-7	Ireland Siltstone	191.2	907.3	2,190	1.46		
B-17	Robbins Shale	131.4	969.8	1,190	0.345		
B-11	Robbins Shale	140.4	949.6	1,950	1.31		
P-9	Robbins Shale	235.8	868.7	407	0.0225	0.33	0.022

TABLE 3.6—continued

Boring	Geologic Unit and Lithology	Depth (feet)	Elevation (feet)	Unconfined Compressive Strength (psi)	Static Modulus of Elasticity* times 10^{-6} (psi)	Poisson's Ratio*	Bulk Modulus times 10^{-6} (psi)
P-9	Haskell Limestone	262.1	842.4	12,430	13.0	0.21	7.5
P-9	Vinland Sandstone	287.2	817.3	2,170	0.428	0.32	0.40
B-9	Vinland Siltstone	292.3	785.7	2,980	1.02		
B-17	Tonganoxie Shaley Siltstone	219.5	881.7	1,260	0.357		
B-17	Tonganoxie Siltstone	261.3	839.9	2,790	0.957		
B-17	Tonganoxie Siltstone	301.3	799.9	3,130	0.968		
B-9	Tonganoxie Shale	312.4	765.6	1,670	0.368		
B-4	Weston	369.3	729.2	1,250	0.555		

TABLE 3.7—BEDROCK TEST DATA, MELVERN DAM PROJECT.

Bedrock unit	Rock Type	Unconfined Compression *tons/ft²* No. Tests	Avg	Max	Min	Dry Weight *lbs/ft* No. Tests	Avg	Moisture Content *% dry weight* No. Tests	Avg	Wetting - Drying No. Tests	Cycles	Average % loss
Calhoun	Sh	3	94	127	67	5	141	5	7.6	5	100	1
Ervine Creek	Ls	0										
Larsh-Burroak	Sh	1	7			1	140	1	12.0	1	100	1
Rock Bluff	Ls	0										
Oskaloosa	Sh	3	46	76	12	3	130	3	10.3	2	100	1
Ozawkie												
Zone A	Ls	3	329	470	110	3	149	3	6.0	1	0	20
Zone B	Sh	2	22	33	10	3	133	3	10.7	0		
Zone C	Ls	6	486	643	275	6	164	6	1.7	0		
Tecumseh												
Zone A	Sh	10	46	120	1	10	135	10	9.3	8	100	1
Zone B	Ls	4	1197	1510	604	4	169	4	1.0	2	0	20
Zone C	Sh	1	8			1	112	1	16.0	1	100	1
Avoca	Ls	3	967	1234	564	3	168	3	0.7	1	0	20
King Hill												
Zone A	Sh	4	344	796	141	4	157	4	4.5	3	67	11
Zone B	Sh	5	71	147	41	5	142	5	7.4	6	100	1
Beil	Ls	4	766	1036	490	4	164	4	1.8	1	0	20
Queen Hill	Sh	1	237			1	128	1	6.0	1	100	1
Big Springs	Ls	2	992	1505	478	2	166	2	0.6	0		
Doniphan	Sh	19	100	393	3	19	148	19	5.4	18	100	2
Spring Branch	Ls	1	1192			1	157	1	5.0	0		
Stull	Sh	4	72	127	44	4	143	4	6.3	4	100	1
Clay Creek	Ls	3	913	1372	629	3	169	3	0.6	0		
Jackson Park	Sh	14	167	402	12	17	142	17	7.8	10	70	7

TABLE 3.8—BULK DENSITIES OF SELECTED ROCK SAMPLES AT WOLF CREEK GENERATING STATION

Boring	Geologic Unit and Lithology	Depth (feet)	Elevation (feet)	Wet Density (pcf)
P-9	Heumader Member; moderately weathered shale	18.8	1085.7	138
P-2	Heumader Member; calcareous, non-clayey, fossiliferous, unweathered shale	28.0	1076.6	160
P-3	Heumader Member; calcareous, non-clayey, unweathered shale	39.2	1074.0	149
P-12	Heumader Member; moderately weathered shale	14.0	1088.2	138
P-6	Heumader member; clayey, slightly weathered shale	27.0	1079.6	139
P-6	Heumader Member; very calcareous, fossiliferous, unweathered shale	38.0	1068.6	141
P-11	Heumader Member; very calcareous, very clayey, slightly weathered shale	36.1	1067.3	137
P-10	Heebner Member; carbonaceous shale	56.4	1052.0	139
P-10	Heebner Member, carbonaceous shale	56.9	1051.5	137
P-10	Snyderville Member; very calcareous shale	63.3	1045.1	141
P-10	Unnamed Member of Lawrence Formation; siltstone	91.2	1017.2	144
P-9	Unnamed Member of Lawrence Formation; sandy siltstone	94.2	1013.3	156
P-10	Ireland Member; clayey shale	121.4	987.0	148
P-10	Ireland Member; silty sandstone	140.3	968.1	153
P-9	Ireland Member; siltstone	152.5	952.0	155
P-9	Ireland Member; silty shale	187.8	916.7	156
P-10	Ireland Member; shaley siltstone	221.9	886.5	147
P-10	Robbins Member; shale	232.8	875.6	157
P-9	Robbins Member; shale	256.0	848.5	154
P-10	Robbins Member; shale	267.9	840.5	138

TABLE 3.8—continued

Boring	Geologic Unit and Lithology	Depth (feet)	Elevation (feet)	Wet Density (pcf)
P-10	Vinland Member; carbonaceous shale	284.5	823.9	153
P-10	Vinland Member; siltstone	291.0	817.4	151
P-10	Tonganoxie Member; sandy shale	324.6	783.8	154
P-10	Tonganoxie Member; shale	340.8	767.6	156
P-9	Tonganoxie Member; shale	343.2	761.3	156
P-10	Weston Member; shale	347.3	761.1	155
P-10	Weston Member; shale	356.1	752.3	150
P-9	Weston Member; shale	392.8	711.7	163

TABLE 3.9—RESULTS OF SWELLING PRESSURE TESTS ON SHALE AT WOLF CREEK GENERATING STATION PROJECT

Boring	Depth (feet)	Geologic Unit	Time (minutes)	Swelling Pressure (psf)
B-19	17.3	Jackson Park	0	100
			30	425
			90	675
			1020	850
			1500	900
B-6	24.7	Jackson Park	0	100
			30	150
			60	200
			4320	225
B-7	36.5	Jackson Park	0	100
			420	125
			1440	225
			1740	200
B-6	48.0	Heumader	0	100
			30	225
			60	325
			120	425
			240	511
			1200	630
			1440	675
			4320	725
B-14	42.2	Heumader	0	100
			60	650
			120	760
			1080	850
			1440	900
			2520	900
B-14	43.3	Heumader	0	100
			15	225
			60	275
			2520	480
B-6	78.4	Heebner	0	100
			60	225
			180	325
			1080	511
			1440	550
			2640	560
B-19	63.5	Heebner	0	100
			15	225
			60	425
			1020	800
			1440	830
			2460	835
B-6	81.8	Snyderville	0	100
			15	325
			30	425
			60	630
			1440	1400
			2700	1500
			4320	1600

TABLE 3.9—continued

Boring	Depth (feet)	Geologic Unit	Time (minutes)	Swelling Pressure (psf)
B-19	69.4	Snyderville	0	100
			60	110
			120	110
			180	125
			2880	130
B-15	55.4	Snyderville	0	100
			360	125
			1440	135
			2880	160
			4320	175
B-16	45.3	Unnamed Lawrence	0	100
			5	225
			15	225
			30	225
			60	230
			120	250
			1440	275
B-5	89.2	Unnamed Lawrence	0	100
			15	250
			60	325
			120	325
			180	325
			1440	300
B-19	103.3	Unnamed Lawrence	0	100
			15	425
			75	875
			3960	1150
B-5	108.5	Ireland	0	100
			30	325
			900	750
			1800	800
			2400	830
B-19	130.1	Ireland	0	100
			30	775
			90	1030
			1200	1250
			1560	1300
			2760	1425
B-16	99.5	Ireland	0	100
			60	560
			180	725
			420	760
			1740	850
			4260	900
B-6	226.0	Robbins	0	100
			15	275
			180	2100
			240	2400
			420	2800
			1260	3425
			1800	3500
			2640	3550
			2880	3560
			6720	3725

TABLE 3.10—RESULTS OF CLAY MINERALOGY AND SLAKING TESTS ON SHALE SAMPLES AT WOLF CREEK GENERATING STATION

Boring	Depth (feet)	Elevation (feet)	Geologic Unit	Percent Illite[1]	Percent Chlorite[1]	Id, One Cycle Test[2] Kaolinite[1]	Id, Two Cycle Test[2] (percent)	Slaking (percent)	Descriptive Durability[2]
B-19	17.3	1074.9	Jackson Park	50	30	20	93	85	Medium High
B-6	24.7	1103.7	Jackson Park	40	40	20	81	48	Low
B-7	36.5	1061.9	Jackson Park	50	40	10	82	44	Low
B-6	48.0	1080.4	Heumader	50	30	20	85	64	Medium
B-14	42.2	1074.2	Heumader	50	30	20	80	57	Low
B-14	43.3	1073.1	Heumader	50	30	20	76	51	Low
B-6	78.4	1050.0	Heebner	70	20	10	98	97	High
B-19	63.5	1028.7	Heebner	70	20	10	98	95	High
B-6	81.8	1046.6	Snyderville	80	15	5	16	3	Very Low
B-19	69.4	1022.8	Snyderville	80	10	10	9	4	Very Low
B-15	55.4	1038.5	Snyderville	80	10	10	13	5	Very Low
B-16	45.3	1059.4	Unnamed Lawrence	50	30	20	52	9	Very Low
B-5	89.2	1004.7	Unnamed Lawrence	50	40	10	93	79	Medium
B-19	103.3	988.9	Unnamed Lawrence	40	40	20	92	87	Medium High
B-5	108.5	985.4	Ireland	50	30	20	93	81	Medium
B-19	130.1	962.1	Ireland	50	30	20	90	81	Medium
B-16	99.5	1005.2	Ireland	50	30	20	89	70	Medium
B-6	226.0	902.4	Robbins	40	40	20	91	76	Medium

[1]Clay mineral data is presented as a percentage of the total clay fraction.
[2]Slake-durability testing is described in Section 2.5.6.4.7.2.

TABLE 3.11—FIELD PERMEABILITY TEST RESULTS, ULTIMATE HEAT SINK, WOLF CREEK GENERATING STATION PROJECT.

A. Pressure Water-Loss Testing

Member	Average Permeability* (cm/sec)	Permeability Range (cm/sec)	Number of Test	Number of No Takes (Ø)
Heumader	3.0×10^{-6}	Ø - 6.0×10^{-6}	8	6
Plattsmouth Ls.	4.0×10^{-6}	Ø - 1.4×10^{-5}	26	15
Heebner	9.0×10^{-6}	Ø - 2.9×10^{-5}	29	16
Leavenworth Ls.	7.0×10^{-6}	Ø - 3.6×10^{-5}	29	13
Snyderville	9.0×10^{-6}	Ø - 4.8×10^{-5}	36	17
Toronto Ls.	2.0×10^{-5}	Ø - 1.0×10^{-4}	22	6

*Ø = No take recorded. 10^{-8} cm/sec assumed when computing averages.

B. Falling Head Permeameter Testing

Boring Number	Piezometer	Slotted Interval (feet)	Members Monitored	Permeability (cm/sec)
HS-1	A	2.5 - 19.5	Soil-Plattsmouth Ls.	6.1×10^{-6}
	B	30.0 - 37.0	Snyderville-Toronto Ls.	2.7×10^{-6}
HS-3	A(test 2)	3.0 - 17.9	Plattsmouth Ls. Toronto Ls.	8.5×10^{-6}
HS-5	A	4.8 - 9.8	Plattsmouth Ls.	9.0×10^{-6}
	B	23.5 - 30.3	Snyderville-Toronto Ls.	5.4×10^{-7}
HS-8	A	4.8 - 9.8	Plattsmouth Ls.	4.4×10^{-6}
	B	31.0 - 39.5	Snyderville-Toronto Ls.	2.2×10^{-6}
HS-20	A(test 2)	2.0 - 18.0	Soil-Plattsmouth Ls.	7.6×10^{-6}
	B	35.0 - 43.0	Toronto Ls.	nil
HSA-1	A	3.0 - 11.5	Soil	nil
	B	25.0 - 22.2	Toronto Ls.	1.7×10^{-5}

various other types of mechanized mining equipment designed to operate with low overhead clearance can also be used in many situations. The use of large- and small-diameter shaft-sinking machines should be considered. Raise-boring machines designed to operate at the surface to drill or ream upwards using pre-drilled kelly-bar holes should be considered for many of the exit/vent shaft-drilling operations. The early availability of electrical power at the site is an advantage because many of these machines are or can be electric powered, which is desirable for safety, economic, and environmental reasons.

The presence of major support infrastructure already located near or at the site provides the opportunity for quick start-up and fast-track scheduling which, in addition to a tunneling medium that can be excavated rapidly using current technology and proven equipment, is an advantage of the Kansas site. The following proposed sequence of start-up and early construction operations demonstrates these possibilities.

As described in Section 4.1.2, ready access to the site for early transportation of construction equipment and supplies is available by heavy railroad to the south part of the complex via Atchison, Topeka & Santa Fe double-track mainline from Kansas City to Tulsa, with major sidings at Ottawa and local sidings at Pomona and Quenemo. More direct access is provided by mainline Missouri Pacific, also at Ottawa, but with three sidings at Lomax Junction, immediately adjacent to shaft F4, which will be discussed below as a possible staging area for early operations. An infrequently used and poorly maintained Missouri Pacific branch line goes north from Lomax Junction to Topeka and has small sidings at Michigan Valley and Overbrook on the east and northeast segments of the oval. Major rail access is also available via Union Pacific double-track mainline at Topeka and by Atchison, Topeka & Santa Fe south to Emporia along the west side of the oval on its original route from Atchison to Santa Fe. It has sidings near the oval at Carbondale, Scranton, Burlingame, and Osage City.

Heavy truck and highway access is also available via U.S. Interstate 70 and the Kansas Turnpike at Topeka; access to Kansas City and Wichita is available via I-35 in the south and east sectors. Local access from these routes directly to and through the site is via four-lane U.S. Highway 75 south from Topeka to the north side of the site, U.S. 56 east-west across the northern part, and Kansas Highways 31, 268, and 68 across the south part. Forbes Field, immediately south of Topeka, is a former U.S. Air Force Strategic Air Command B-47 base with long and heavy runways, capable of landing any existing cargo aircraft. Major barge-unloading terminal facilities are available on the Missouri River at Kansas City.

It is assumed that sinking of major shafts and excavation of starter tunnels for the tunnel-excavating machines will start as soon as land is available and clearing/leveling operations permit. As described in Volumes 2 and 6, acquisition of rights-of-way, easements, and fee-simple titles to these sites will commence first and be expedited. Improvement of existing roads, reinforcement of bridges where required, and construction of access and haul-roads will also be an early task. Drilling of two deep-injection disposal wells at, or in the vicinity of, the north and south clusters, construction of lined ponds at the major shaft sites, and sediment-retaining ponds near the campus also will be among the first tasks. Acquisition of abandoned limestone quarries and construction of haul- and access-roads for disposal of tunnel and underground excavated spoils will proceed at the same time.

As described previously in Section 3.2.2, the proposed vertical tunnel alignment is such that its shallowest part is near shaft F4 in the southeast quadrant. This is also immediately adjacent to Lomax Junction and the railroad sidings there, and to Kansas Highways 268 and 68. Easements for a major construction staging area could be acquired adjacent to the railroads, highways, and the tunnel in that area. It is suggested that two TBMs be assembled at the surface in this staging area. After entrance adits are cleared into an unweathered face, each TBM can commence drilling at a shallow angle down to the tunnel alignment and grade. The TBMs will then proceed in opposite directions towards shafts F3 and F5, respectively, while those shafts are being sunk. This work could start before, or at the same time that major shaft sinking is begun at the north and south clusters, allowing an early start on a quarter of the tunnel. The short remaining segments of tunnel in the vicinity of F4 can be excavated with road-headers or similar equipment while the F4 shaft is being sunk from the surface by conventional methods or by a raise-boring machine. In similar fashion, shafts E4 and E5 could be constructed by raise-boring machines at the surface, boring upward from a gallery adjacent to the tunnel after the TBMs pass their locations. Rock cuttings from the machine would fall to the underground gallery and be mucked by conveyor via a short horizontal connecting tunnel to muck cars switched into an alcove excavated into the side of, and parallel to, the main tunnel.

With the possible time that may be saved by assembling the two TBMs at the surface and having them work simultaneously in two segments of the tunnel, it may be feasible to have them continue on to F2 and F6, with the south machine driving the long by-pass tunnel proposed at the south cluster.

Other underground construction at various segments of the tunnel and clusters could be done as previously planned, although it is assumed that the average daily advance rates in both tunneling and shaft sinking will be faster than the CDG estimates because of the large proportion of shale that will be involved at this site. Construction of the collider halls and other chambers in

shale, or shale and interbedded limestone or sandstone, at the depths of the proposed tunnel, presents a challenge. The large free-spans and heights of the chambers (especially the possible 160-feet-long by 120-feet-wide by 130-feet-high hall mentioned briefly in the ISP) will be an engineering challenge in any rock type, wherever proposed. The following suggested method is largely conceptual but seems feasible. Because of the low compressive strengths of the shales, sandstones, and relatively thin limestones, and the fact that the units will be in tension over the unsupported free-spanning roofs of the chambers, it is recommended that these strata not be relied upon as primary structural media unless well-reinforced or tied together by deep-drilled rock bolts where applicable. The suitability of these rock units for rapid excavation of small machine- or hand-driven tunnels may be utilized to advantage, however, for driving a series of parallel, sequentially stacked drift tunnels in an arched configuration above the proposed chambers to take up most of the overburden pressure. These tunnels should have square or rhomboidal cross sections with sufficient dimensions that after each short segment is driven, reinforced, and supported or lined, long epoxy-grouted rock bolts can be drilled radially outward and anchored in the shale or mixed limestone-shale outside the walls. When each drift is completed and backfilled with pumped concrete, it would roughly interlock with the tunnel above it, which would be constructed using the concrete roof of the previous tunnel as its floor. The tunnels could be started simultaneously at either side of the top of the proposed large chamber, sufficiently outwards from the location of its outer walls so that lateral support will not be affected by construction of the chamber. The successive tunnels should be stacked sequentially upwards and inwards so that the final, end-on configuration of the complex of concrete-filled tunnels is a large arch in the otherwise undisturbed strata. The arch is not intended to serve as a part of the structure of the chamber itself. Its segments are intended to settle and interlock as the chamber is excavated to reduce the compressive loads that the roof and walls of the chamber would otherwise have to be designed to withstand. Vertical walls of the chamber itself could be constructed as panels of pre-cast or pumped concrete placed in slots cut into the in-place strata by coal saws or similar equipment. The shale or other rock under the protective arch could be mined out so that the chamber roof could be constructed on top of the in-place strata remaining inside the walls. The in-place material would be the bottom forms of the roof. Enclosed material inside the chamber could then be mined out in horizontal benches from the top downward after the reinforced roof was completed and set. Rock bolts and anchors should be drilled horizontally through the walls into the strata outside them at vertical intervals and sufficient distances apart to act as tie-backs to resist lateral pressure on the walls. A thick and heavily reinforced floor would then be cast on the exposed substrate as a next to final operation. A thin layer of shotcrete could be applied to the walls and roof to complete the work.

3.5.5 Disposal of Spoils from Tunneling and Other Construction

There will be a need to dispose of approximately 1.8 million cubic yards of spoils from the construction of the SSC. The spoils are from the construction of the ring tunnel and the buildings in the campus complex. Spoils totaling 1.147 million cubic yards are estimated from the tunnel and .653 million cubic yards are estimated from the campus complex. These figures take into account a 20 percent increase for volumetric expansion of disturbed materials.

The spoils are composed mostly of shale and limestone. Neither are considered to be inherently toxic. However, some shales contain pyrite, which, upon weathering, breaks down to form weak sulfuric acid solutions; some may contain included-pore water, which has sodium and/or magnesium chloride and other minerals.

The disposal of the spoils from the site considered the following major objectives: 1) locating disposal sites close to excavation areas, eliminating long haul roads; 2) using as few disposal sites as possible, keeping acquisition costs low; 3) avoiding hauling spoils through incorporated areas; 4) avoiding using major highways for haul roads, eliminating congestion and reducing potential for accidents; 5) placing spoils in areas that had been previously disturbed; 6) burying and neutralizing any toxic spoils that may be encountered; 7) using spoils as fill material in areas needing to be reclaimed; and 8) avoiding sensitive wildlife habitats.

Several abandoned and active limestone-quarry sites are in the immediate area. In addition, several abandoned surface coal mines are in need of reclamation. The limestone quarries are mostly found in the southern half and eastern two-thirds of the site; the abandoned coal mines are mostly in the west and northwest area of the ring. Twenty such sites were initially identified and reviewed. Using the criteria outlined in the objectives, several sites were identified.

The tunnel was divided into excavation zones and each zone assigned the number of the corresponding shaft where spoil material would exit. Each of the quarries or mines (pits) was then assigned portions of the tunnel according to the capacity of the pit and the haul distance. The average haul distance is 4 miles; the longest haul is 7 miles. The pit capacity was conservatively computed to ensure the capacity of each pit to handle the assigned spoils. The analysis of spoils with corresponding storage sites is illustrated in Table 3.12.

The total capacity of the seven designated spoils-storage sites equals 3,110,231 cubic yards. With only 1.8

TABLE 3.12—TUNNEL SPOIL STORAGE FOR SSC.

Pit #2 - capacity = 437,778 cu yd (2-18, 2-20)	E-9 F-9 E-10	45,064 cu yd 50,518 cu yd 45,064 cu yd --- 140,646 cu yd + 20% = 168,775 cu yd
Pit #4 - capacity = 194,444 cu yd (2-26,2-28)	F-10 E-1 F-1	50,518 cu yd 45,064 cu yd 50,518 cu yd --- 140,100 cu yd + 20% = 175,100 cu yd
Pit #7 - capacity = 1,041,667 cu yd (12-8, 11-10)	E-2 F-2	45,064 cu yd 50,518 cu yd --- 98,582 cu yd + 20% = 114,582 cu yd
Pit #11 - capacity = 69,444 cu yd (6-18,6-20)	F-8	50,518 cu yd + 20% = 60,622 cu yd
Pit #15 - capacity = 138,889 cu yd (8-15,8-17)	F-7 E-8	50,518 cu yd 45,064 cu yd --- 95,582 cu yd + 20% = 114,698 cu yd
Pit #17 - capacity = 312,500 cu yd (10-14, 10-16)	E-6 F-6 E-7	45,064 cu yd 50,518 cu yd 45,064 cu yd --- 140,646 cu yd + 20% = 168,775 cu yd
Pit #19 - capacity = 729,167 cu yd (9-32, 9-34)	E-3 F-3 E-4 F-4 E-5 F-5	45,064 cu yd 50,518 cu yd 45,064 cu yd 50,518 cu yd 45,064 cu yd 50,518 cu yd --- 286,746 cu yd + 20% = 344,095 cu yd

million cubic yards of spoils anticipated, there is a surplus storage capacity of 1.31 million cubic yards. The State of Kansas will acquire 860 acres of land, which includes and surrounds these sites. At the request of the Department of Energy, the State will deliver fee simple title for the disposal areas, or acquire use easements for the time necessary to complete disposal of the spoils and surface restoration of the areas.

Ten alternatives were generated and are suggested for the disposal of the spoils at these sites. There are three types of pits: an enclosed limestone quarry where the pit has four walls and internal drainage, an open limestone quarry which is at grade on one side and has walls on the other, and the abandoned coal mine. In each case, three scenarios were considered. Each pit type was designed for non-toxic spoils, toxic spoils, and for possible interface with an active aquifer.

Non-toxic shale spoils would be placed in 12-inch compacted layers. A limestone layer would be placed just under the final layer of topsoil. Proper drainage would be insured.

Toxic spoils would be isolated in the lower layers and sealed with bentonite. Enough non-toxic materials would adjoin the toxic materials to buffer them from the ecosystem.

If seepage layers are encountered, a layer of limestone aggregate would be placed at the level of the aquifer. The aquifer should remain intact if the limestone aggregate is laid in a thick layer. Since there is more storage capacity than necessary, it is suggested that a reclamation plan be developed for each proposed disposal site. All ten alternatives are presented in Figures 3.14-3.23.

A map indicating the disposal sites and the proposed haul roads is illustrated in Figure 3.24.

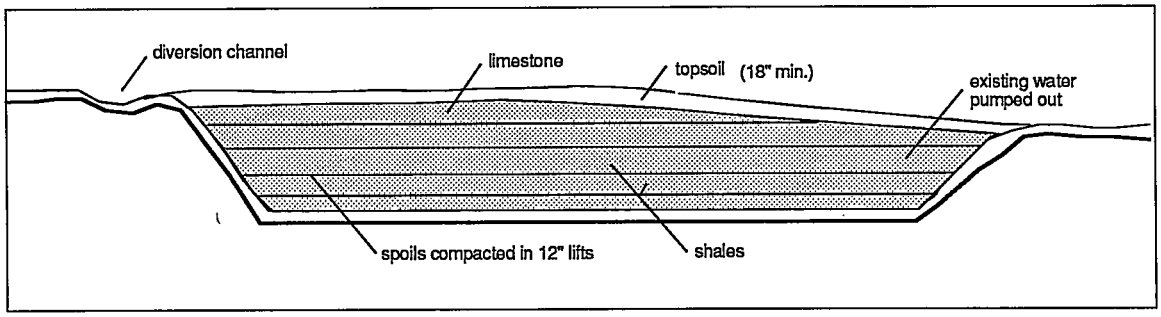


FIGURE 3.14—SPOILS DISPOSAL, ALTERNATIVE 1, ENCLOSED STONE QUARRY. Non-toxic spoils.

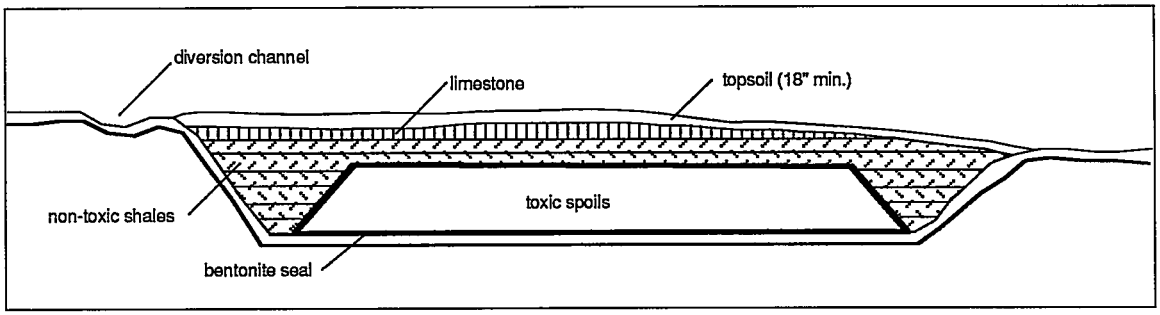


FIGURE 3.15—SPOILS DISPOSAL, ALTERNATIVE 2, ENCLOSED STONE QUARRY. Toxic spoils.

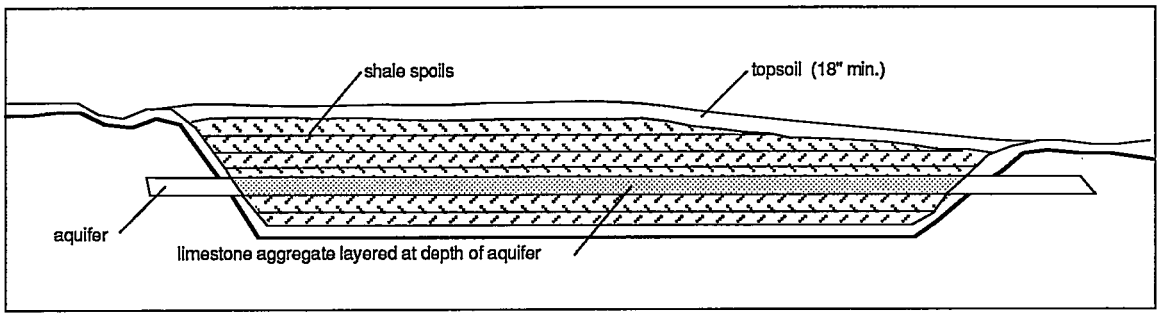


FIGURE 3.16—SPOILS DISPOSAL, ALTERNATIVE 3, ENCLOSED STONE QUARRY. Non-toxic spoils with aquifer.

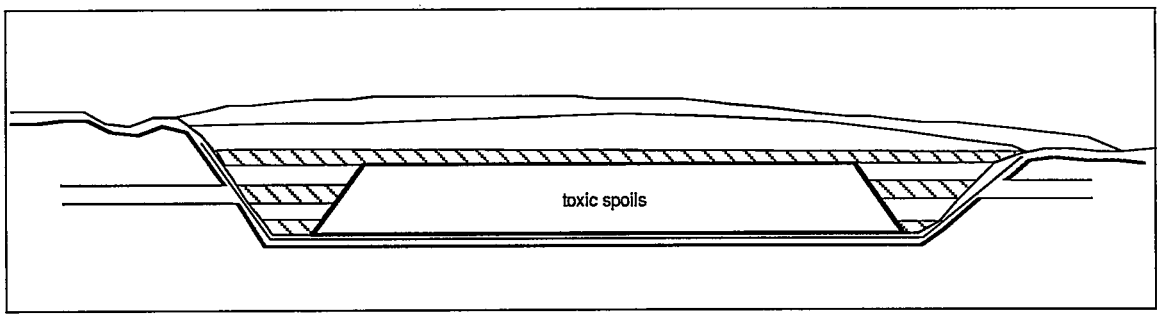


FIGURE 3.17—SPOILS DISPOSAL, ALTERNATIVE 4, ENCLOSED STONE QUARRY. Toxic spoils with aquifer.

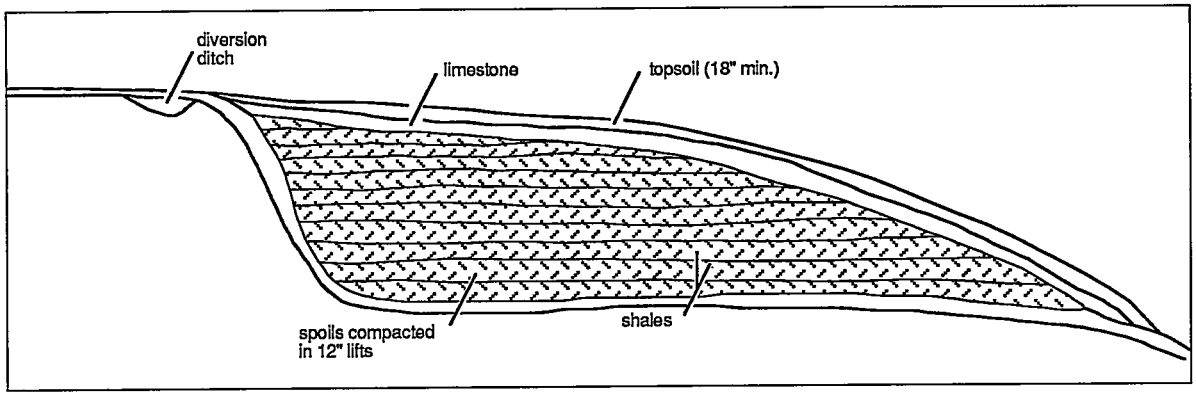


FIGURE 3.18—SPOILS DISPOSAL, ALTERNATIVE 5, STONE QUARRY. Non-toxic spoils.

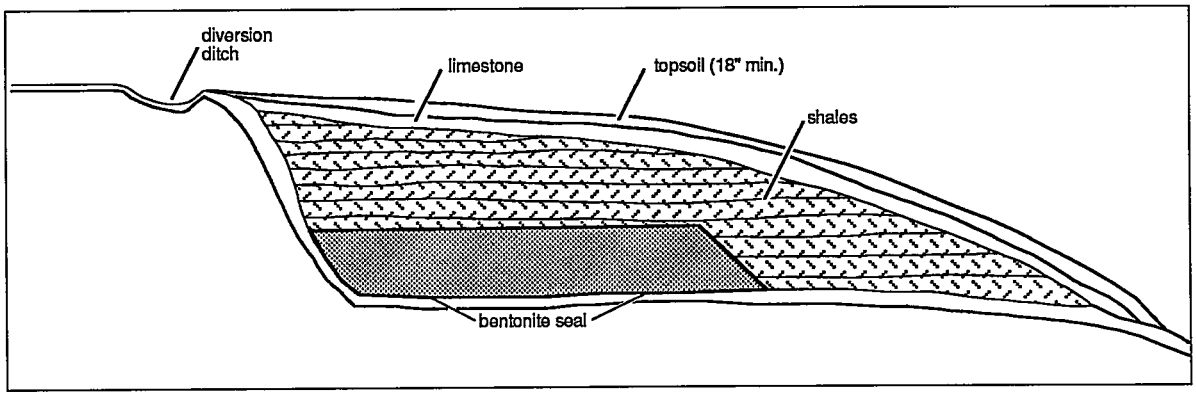


FIGURE 3.19—SPOILS DISPOSAL, ALTERNATIVE 6, STONE QUARRY. Toxic spoils.

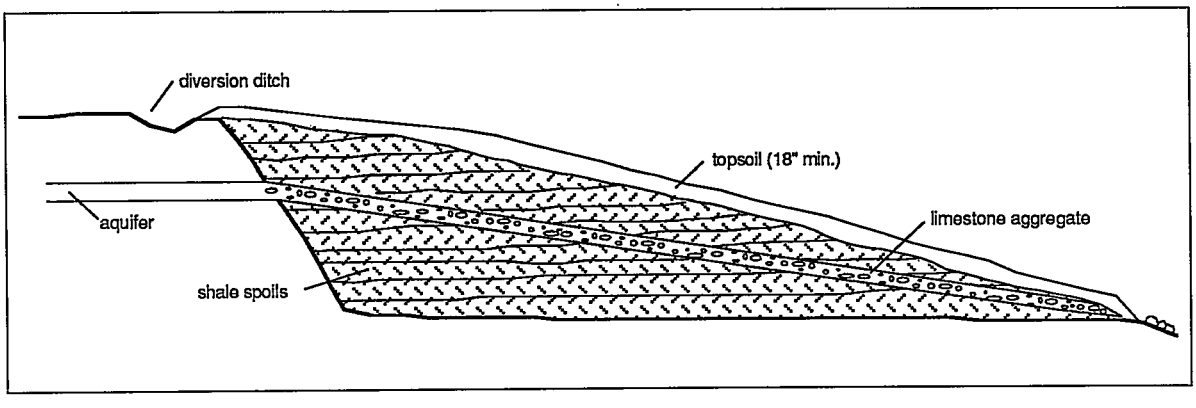


FIGURE 3.20—SPOILS DISPOSAL, ALTERNATIVE 7, STONE QUARRY. Non-toxic spoils with aquifer.

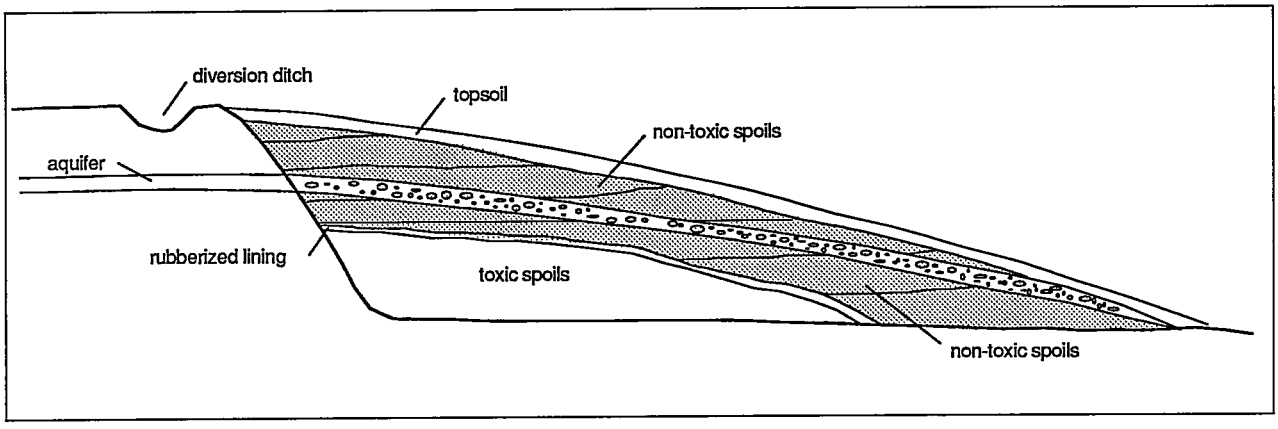


FIGURE 3.21—SPOILS DISPOSAL, ALTERNATIVE 8, STONE QUARRY. Toxic spoils with aquifer.

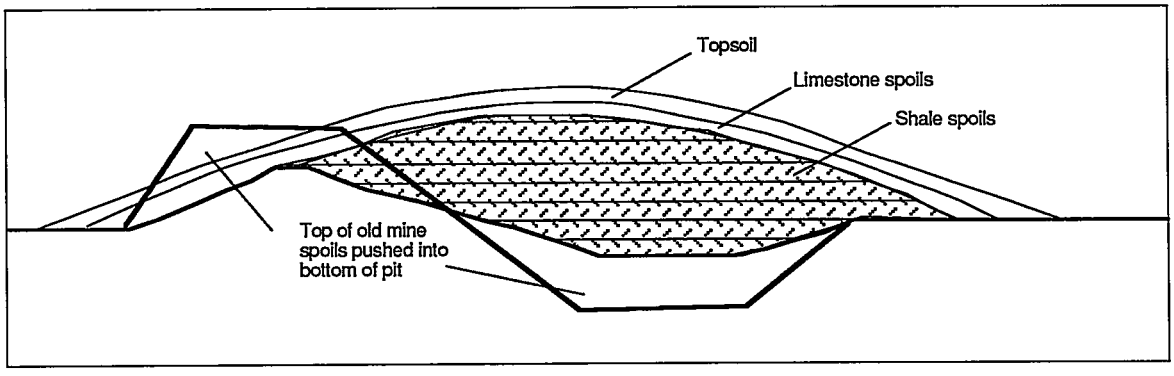


FIGURE 3.22—SPOILS DISPOSAL, ALTERNATIVE 9, ABANDONED MINE PIT. Non-toxic spoils.

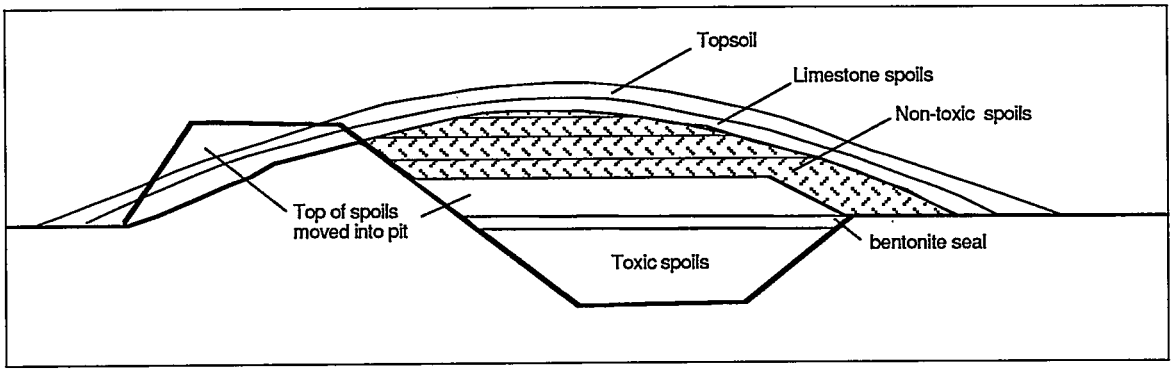


FIGURE 3.23—SPOILS DISPOSAL, ALTERNATIVE 10, ABANDONED MINE PIT. Toxic spoils.

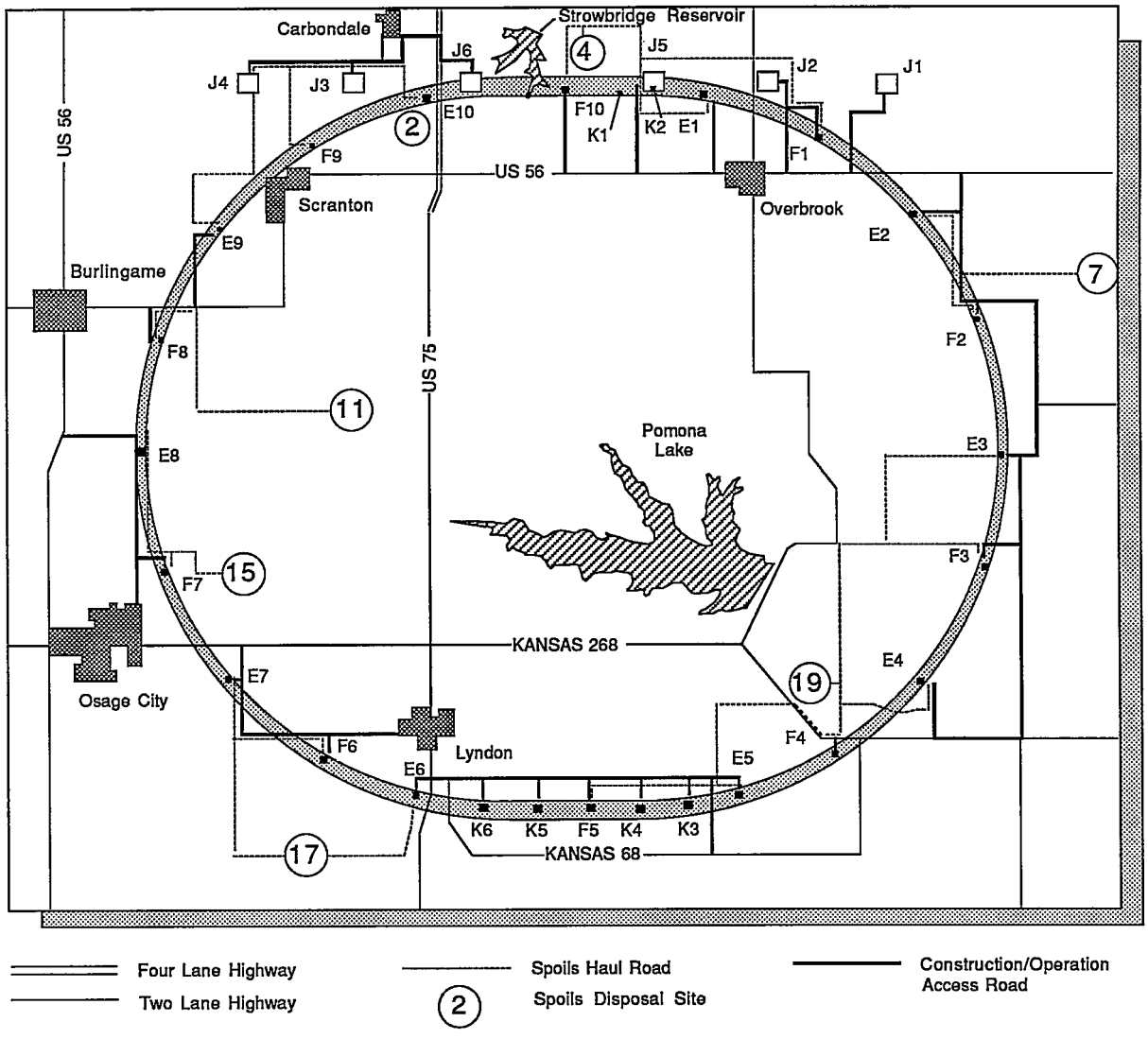


FIGURE 3.24—PROPOSED DISPOSAL SITES AND HAUL ROADS.

Disposal of water encountered during underground construction

A scheme for disposal of any fresh, brackish, or highly mineralized water produced during construction of tunnels and underground chambers is proposed. This proposal meets Kansas and U.S. EPA standards and regulations. The proposed plan also addresses the later need, during operation of the SSC facility, for disposal of blow-down water from the helium-refrigeration system cooling towers and from water treatment and de-ionization systems.

It is estimated that a maximum of 30 to 40 gallons per minute of fresh to brackish water may be produced during tunneling in certain parts of the ring, especially in its eastward and southeastward quadrants. It is also probable that grouting outside the tunnel lining will not cut off all the possible seepage, which may continue at a diminished rate during the facility's operation. A proposed subdrain laid at the low point of the tunnel cross section has been provided in the conceptual tunnel design to collect this seepage. The water produced during construction and later seepage can be drained to, and pumped from, sumps at the F shafts.

To take care of any seepage water, cooling-tower blow-down water, and water produced during tunneling operations, it is proposed that lined ponds be constructed at each F-shaft site prior to the start of tunneling operations at that shaft. Plans for acquiring additional land for the construction of the ponds have been provided in our proposed acquisition schedule. At the same time, and as one of the earliest tasks scheduled at the site, Class I

underground injection wells, for which permits must be issued by Kansas authorities, will be drilled in the vicinity of the north and south cluster areas. These wells will be drilled to the Arbuckle Formation at an average depth of about 2,400 feet. In the collider area, this formation will accept about 55,000 gallons per minute under gravity flow. In addition to Underground Injection Control permits for the two Class I disposal wells, it is suggested that NPDES permits be acquired at the same time to take care of any proposed discharge of fresh or environmentally safe fluids at the surface.

Any water produced during tunneling or underground-construction operations and subsequently would be pumped into the lined holding-ponds and tested. If it meets proper standards, it could be discharged to the nearest surface watercourse or used for construction water, irrigation, etc. If it does not meet quality standards, it will be collected and hauled periodically to the closest of the two disposal wells. Either 10,000 gallon-capacity, construction-type water trucks or regular tank trucks could be used.

After construction, the lined ponds would be used for collection of cooling-tower blow-down and water-treatment effluents and similar fluids, which would also be periodically collected and hauled to the approved disposal well or wells for injection. The disposal well at the north campus/work area would be maintained and used during the lifetime of the project. The well near or at the south cluster area would either be retained or closed after construction is completed.

References

Algermissen, S. T., and Perkins, D. M., 1976, A probabalistic estimate of maximum acceleration in rock in the contiguous United States: U.S. Geological Survey, Open-file Report 76-416, 45 p.

Ball, Stanton M., Ball, Mahlon M., and Stockman, Kenneth W., 1963, Geology of Franklin County, Kansas: Kansas Geological Survey, Bulletin 163, 57 p.

Crone, A. J., and Luza, D. V., 1986, Holocene deformation associated with the Meers fault, southwestern Oklahoma: Oklahoma Geological Guidebook 24, p. 68-74.

Crook, Maurice C., 1971, Assumed effect of Clinton Reservoir on the Tonganoxie sandstone aquifer: unpublished research project, The University of Kansas, Department of Geology, 29 p.

Dickey, Harold P., and Pennery, Harold, 1985, Soil survey of Osage County, Kansas: U.S. Department of Agriculture, Soil Conservation Service, and Kansas Agricultural Experiment Station, 100 p., maps.

Dubois, S. M., and Wilson, F. W., 1978, A revised and augmented list of earthquake intensities for Kansas, 1867-1977: Kansas Geological Survey, Environmental Geology Series 2, 56 p.

Fenneman, Nevin M., 1957, Physical divisions of the United States: Edition of 1946. U.S. Geological Survey, Washington, D.C.

Johnson, William D., Jr., and Adkison, W. L., 1967, Geology of eastern Shawnee County, Kansas, and vicinity: U.S. Geological Survey, Bulletin 1215A, p. 1-123.

Kansas City Power & Light Company and Kansas Gas & Electric Company, 1974-1975, Wolf Creek Generating Station preliminary safety analysis report, addendum, vol. 2 and revisions through 1975.

Kansas Gas and Electric Company and Kansas City Power and Light Company, 1974, Wolf Creek Generating Station Environmental Report Volume I, Table 2.5-4.

Macfarlane, P. Allen, 1981, unpublished data from Douglas Group Sandstone Aquifer Study, Kansas Geological Survey.

McClain, Thomas J., 1985, unpublished data from Kansas Geological Survey drilling program.

O'Connor, Howard G., 1955, Rock formations of Osage County; *in*, Geology, Mineral Resources, and Ground-water Resources of Osage County, Kansas: Kansas Geological Survey, vol. 13, part 1, p 5-20.

O'Connor, Howard G., 1960, Geology and ground-water resources of Douglas County, Kansas: Kansas Geological Survey, Bulletin 148, 200 p.

Russ, D. P., 1982, Style and significance of surface deformation in the vicinity of New Madrid, Missouri; in, Investigations of the New Madrid, Missouri, Earthquake Region: U.S. Geological Survey, Professional Paper 1236, Chapter H, p. 95-114.

Schoewe, Walter H., 1949, The geography of Kansas: Kansas Academy of Science, Transactions, vol. 52, p. 261-333.

Stewart, Gary F., 1967, Jointing in Upper Pennsylvanian limestones in northeastern Kansas; in, Short Papers on Research in 1966: Kansas Geological Survey, Bulletin 187, part 1, p. 17-19.

Wilson, Frank W., O'Connor, Howard G., Paul, Shirley, and Chaffee, Pamela K., 1986, A feasibility study of sites for the proposed Superconducting Super Collider in Kansas, preliminary geographic, geological, and geotechnical assessments: Kansas Geological Survey, Open-file Report 87-16, 18 p., illus, maps.

Zoback, Mary L., and Zoback, Mark, 1980, State of stress in the coterminous United States: Journal of Geophysical Research, vol. 85, no. B11, p. 6,113-6,156, illus.

Volume 3

Appendix—Properties of Soils in the Vicinity of the Proposed SSC Project

Properties of Soils in the Vicinity of the Proposed SSC Project

The surface and near-surface soils which will be encountered in shallow excavation and grading on the proposed project are principally upland soils of two associations: 1) **Eram-Lula-Summit**, which occurs on the nearly level to strongly sloping limestone/shale outcrop areas occupying approximately the eastern two-thirds of the project. These soils are deep to moderately deep (5 feet or less), well-drained to moderately well-drained soils and have a silty or clayey subsoil; 2) **Kenoma-Woodson** association occurs in about the western third of the project on nearly level to moderately sloped areas generally underlain by bedrock which is principally shale with some limestone. These soils are deep (about 5 feet or greater), moderately well-drained to somewhat poorly drained, and have a clayey subsoil.

The soils of both associations are classed CL-CH according to the unified soil classification. Table 3.13, is abstracted from the U.S. Department of Agriculture, Soil Conversation Service, Soil Survey of Osage County, issued March 1985.

TABLE 3.13—ENGINEERING INDEX PROPERTIES

Soil Name	Depth (inches)	USDA texture	Classification		% passing sieve no.				Liquid Limit (%)	Plasticity Index
			Unified	AASHTO	4	10	40	200		
Eram	0-9	Silty clay loam	CL	A-6, A-7	85-100	85-100	75-95	33-48	12-25	
	9-28	Clay-silty clay, clay loam	CL, CH	A-7, A-6	95-100	95-100	90-100	85-98	37-65	15-35
	28	Weathered bedrock								
Lula	0-8	Silt loam	CL, ML, CL-ML	A-4, A-6	100	100	96-100	65-97	21-37	1-15
	8-14	Silty clay loam, loam, silt loam	CL	A-6, A-4 A-7	100	100	96-100	65-98	30-43	9-20
	14-44	Silty clay loam, clay loam	CL	A-6, A-7	85-100	85-100	80-100	70-98	33-50	12-26
	44	Unweathered bedrock								
Summit	0-8	Silty clay loam	CL,CH	A-6, A-7	90-100	90-100	85-100	80-99	35-60	11-30
	8-13	Silty clay, silty clay loam, clay	CL, CH	A-7, A-6	85-100	85-100	80-100	80-99	37-65	15-35
	13-60	Clay, silty clay	CH, CL	A-7	85-100	85-100	80-100	80-98	41-70	18-40
Kenoma	0-8	Silty loam	CL, CL-ML	A-4, A-6	85-100	85-100	85-100	85-100	25-40	5-15
	8-53	Silty clay, clay	CH	A-7	85-100	85-100	85-100	85-100	50-75	30-50
	53	Unweathered bedrock								
Woodson	0-8	Silty loam	CL, CL-ML	A-4, A-6	100	100	90-100	85-100	25-40	5-20
	8-28	Silty clay, clay	CH	A-7-6	100	95-100	95-100	90-100	50-65	30-45
	28-60	Silty clay, clay Silty clay loam	CH, CL	A-7-6	100	95-100	95-100	90-100	45-65	20-40

Site Proposal for the Superconducting Super Collider

Kansas

Volume 4

Regional Resources

For more information, contact:

SSC Project Office
Kansas Department of Commerce
400 W. 8th, Suite 500
Topeka, Kansas 66603
(913) 296-5272

Cover art from the original painting "*Explosion of Creation*" by Kansas artist Philomene Bennett

Cover design by Jennifer Sims, Kansas Geological Survey

Contents

4.1 AIRPORTS 1
4.1.1 Accessibility of Airports 1
4.2 HIGHWAYS, STREETS, ROADS, AND RAILROADS 3
4.2.1 Major Transportation Routes 3
4.2.2 Transportation System Improvements 5
4.3 PUBLIC TRANSPORTATION 6
4.3.1 Description of Public Transportation 6
4.3.2 Public Transportation Improvements 6
4.4 INDUSTRIAL AND CONSTRUCTION RESOURCES 6
4.4.1 Accessibility of Industrial Base 6
4.4.2 Labor Pool and Wage Rates 12
4.5 HUMAN RESOURCES 13
4.5.1 Population Distribution of the Vicinity 13
4.5.2 Communities within One-hour Driving Time of the SSC Site 14
4.5.3 Local Employment Rates and Opportunities 14
4.5.4 Equal Employment Opportunity 15
4.6 HOUSING 18
4.6.1 Characterization of Housing in the Vicinity 18
4.6.2 Typical Housing Prices and Rental Levels 18
4.7 COMMUNITY SERVICES 19
4.7.1 Medical Resources 19
4.7.2 Recreation Resources 22
4.8 EDUCATIONAL AND CULTURAL RESOURCES 22
4.8.1 Elementary and Secondary Education 22
4.8.2 Higher Education and Research Institutions 22
4.8.3 Cultural Resources 28
4.9 COMMUNITY SUPPORT 29
4.9.1 Existing and Potential Community Support 29
4.9.2 Existing and Anticipated Opposition 29
4.10 NON-FEDERAL GOVERNMENT SUPPORT 29
4.10.1 Description of State, Regional, and Local Government Support 29
4.10.2 Existing State and Local Laws, Regulations, and Practices 30
4.10.3 State, Regional, and Local Tax Laws 35
4.10.4 State, Regional, and Local Permit and Procedural Support 36

Tables

4.1—Principal airports within vicinity 2
4.2—Vehicular capacity of major roads and highways 5
4.3—Economic structure of major communities in vicinity 7
4.4—Construction-related firms within vicinity 8
4.5—Non-residential construction in vicinity 11
4.6—Recent heavy- and large-construction projects in vicinity 11
4.7—Typical wage rates in proposed SSC region 12
4.8—Population of surrounding counties 13
4.9—Cities of 5,000 or more population within 100 miles of vicinity 14
4.10—Employment in selected counties within one-hours's driving time of SSC 17
4.11—Professional employment within counties surrounding SSC 17
4.12—Median rents by county in vicinity 19
4.13—Availability of physician services in four-county area 21
4.14—Selected statewide education measures 23
4.15—Selected education statistics for four-county area 23
4.16—State-regulated child-care facilities (statewide) 24
4.17—External funding for research in Department of Physics (University of Kansas) 26
4.18—External funding for research in Department of Physics (Kansas State University) 26
4.19—Tuition costs at universities in northeast Kansas and Kansas City, Missouri 28

Figures

4.1—Airport locations within vicinity 2
4.2—Transportation network in vicinity 3
4.3—Local access and haul roads for the SSC site 4
4.4—Population density of surrounding counties 15
4.5—Cities in vicinity of proposed site 16
4.6--Per capita expenditures for personal health care 20
4.7--Per capita expenditures for hospital care 20
4.8--Per capita expenditures for physician's services 20

Plates

4.1—Map of area at 1:250,000 scale showing transportation network in back envelope

4.2—Map of area at 1:100,00 scale showing transportation network and location of SSC site in back envelope

Appendices

1—Letters from Secretary of Transportation to counties in site vicinity concerning transportation improvements
2—High-technology companies in the region
3—Recent heavy and large projects in vicinity
4—Population of cities of 1,000 or greater within 100 miles of site
5—Employment opportunities within one-hour's driving time of site
6—Resolutions of support from surrounding communities and counties

Volume 4—Regional Resources

4.1. AIRPORTS

Kansas' proposed site is readily accessible via several nearby airports. These facilities represent existing passenger and cargo-handling capacity well suited to the SSC's requirements during both construction and operation.

4.1.1 Accessibility of Airports

Kansas City International Airport (KCI), located 18 miles north of Kansas City, Missouri, and a 90-minute drive by interstate and major highways from the proposed SSC campus, is notable among modern airports. The terminal building complex, composed of three modules with provision for a fourth, pioneered the decentralized "drive to your gate" concept in the United States. The design greatly reduces congestion and the distance passengers must walk from ground transportation to aircraft. Baggage claim and rental-car counters are located immediately adjacent to gate areas. Easily accessible parking is provided for 8,300 cars.

Fourteen airlines serve KCI. Eastern, American, US Air, Southwest, Braniff, TWA, Delta, Midway, Continental, United, and Northwest airlines operate aircraft with passenger capacities above 60 people per plane. Air Midwest, Capitol Air, and Midcontinent operate smaller, commuter aircraft. Together, these airlines presently handle 22,700 air travelers per day.

KCI covers 8,600 acres and currently has two 150-foot-wide main runways: a primary 10,800-foot north/south runway and a 9,500-foot east/west runway. Over 125 acres are allocated to cargo-handling activities and a foreign trade-zone site is located immediately east of the airport premises.

Expansion plans include the construction of four additional runways as traffic activity warrants. Capacity analysis shows ample room for development as a large domestic air hub and as an international gateway. Air operations are using 78% of runway capacity; annual passenger-terminal volume is 68% of current capacity; and entry-road traffic is estimated at 67% capacity.

Forbes Field airport (Topeka, Kansas), formerly Forbes Air Force Base, located southeast of Topeka, is 13 miles from the proposed SSC campus and 3 miles from Interstate 70 and the Kansas Turnpike. Forbes has two main runways, an 8,000-foot northeast-southwest runway and a 12,800-foot northwest-southeast runway. The airport is situated on 2,285 acres of land held by the Metropolitan Topeka Airport Authority adjacent to its Topeka Air Industrial Park. A $2.5-million bond issue to build a new water-distribution system for Forbes Field and the industrial park was approved in 1986.

Served by Eastern/Air Midwest Express, Capitol/ Braniff Express, and United Airlines, Forbes Field offers 16 commuter flights daily to KCI and three United departures per day serving major U.S. cities via Denver and Chicago.

A new $5-million, 32,000-square-foot terminal building offers three car-rental agencies, a restaurant, a general aviation lounge, and an adjacent 500-car parking facility with room for expansion.

Forbes Field's capability as a staging area for large operations is demonstrated annually when main elements of the 1st Infantry Division at Fort Riley, Kansas, fly to West Germany for maneuvers. Troops, equipment, and supplies have been assembled and dispatched from Forbes Field for this exercise for the past 11 years.

Forbes Field has two full-service, fixed-base operators. General aviation can also be served at Billard Municipal Airport in northeast Topeka, which has two 5,000-foot and one 3,200-foot runways. Billard Airport is about 25 minutes from the site.

Kansas City Downtown Airport (Kansas City, Missouri) covers 514 acres and operates a 7,000-foot north/south runway and a 5,052-foot east/west runway. Both are 150 feet wide. A remodeled 24,000-square-foot terminal building was completed in 1986. In 1986, the airport handled nearly 37 million pounds of freight and 173,000 aircraft operations. Kansas City Downtown Airport is a 75-minute drive from the proposed SSC campus.

Richards-Gebaur Airport (Kansas City, Missouri), formerly Richards-Gebaur Air Force Base, covers 1,350 acres, with a 9,200-by-150-foot main runway. No commercial airlines operate from this airport; traffic consists of general aviation and military flights. Richards-Gebaur Airport is a 75-minute drive from the proposed SSC campus.

Johnson County Industrial Airport (Olathe, Kansas) is located along Interstate 35, less than an hour from the proposed campus site. The airport has three runways of 7,338, 5,000, and 4,200 feet and can handle aircraft as large as a Boeing 727-200. It also has a full-service, fixed-base operator and a full-capacity instrument landing system.

Marshall Field (Fort Riley, Kansas) serves as an air base for the U.S. Army 1st Infantry. Two identical 4,500-by-150-foot crossing runways serve the base. Marshall Field is restricted to military operations. However, pre-arranged permission to land has been granted in

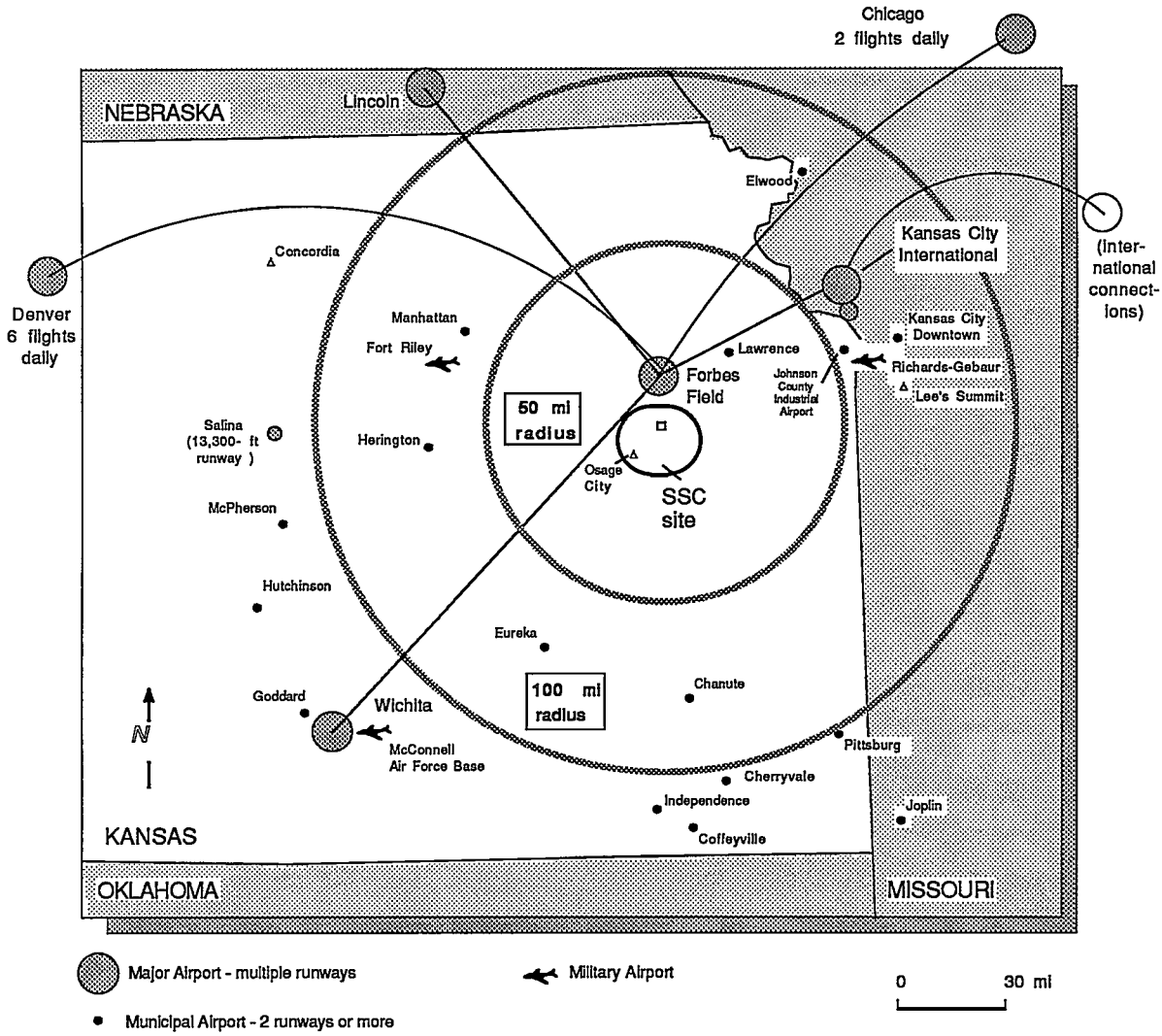


FIGURE 4.1—AIRPORT LOCATIONS WITHIN THE VICINITY.

TABLE 4.1—PRINCIPAL AIRPORTS WITHIN THE VICINITY.

Airport and Location	Type	Driving Time from SSC Site
Kansas City International Kansas City, MO	Major International Comm. & Gen. Aviation	90 min
Forbes Field Topeka, KS	Regional Commercial General Aviation	15 min
Billard Municipal Airport Topeka, KS	General Aviation	25 min
Kansas City Downtown Airport Kansas City, MO	Regional Freight & General Aviation	75 min
Richards-Gebaur Airport Kansas City, MO	Military Airport	75 min
Marshall Field Ft. Riley, KS	Military Airport	75 min
Johnson County Industrial Airport Olathe, KS	General Aviation	70 min

the past for other purposes. The field is a 75-minute drive from the SSC campus. Table 4.1 lists major area airports and their driving times from the SSC main campus area.

Numerous municipal airports are also available for SSC-related activities. These are shown on the airport-location map (Figure 4.1).

4.2 HIGHWAYS, STREETS, ROADS, AND RAILROADS

4.2.1 Major Transportation Routes

Kansas' site is served by a fully developed network of interstate highways, State primary and secondary highways and local county roads, and railroads (Figure 4.2, and Plates 4.1 and 4.2 [in back envelope]).

The site is bracketed by Interstate 70, 15 miles to the north, and Interstate 35, 13 miles to the south, and is bisected by U.S. Highways 75 (north-south) and 56 (east-west).

U.S. Highway 75 is a four-lane, limited-access highway from its intersection with I-70, extending south past Topeka's Forbes Field airport, and passing adjacent to the west boundary of injector area "B". It continues south as a two-lane State primary highway intersecting the far (south) cluster between intermediate access point E-6 and interaction point K-6 and intersecting Interstate 35, 13 miles south of the far cluster. Primary access to Campus Area "A" and to the local roads serving the far-cluster facilities will be from this four-lane facility.

U.S. Highway 56, a two-lane State primary highway, bisects the ring from east to west, intersecting the east side just south of service area F-1 and the west side just south of intermediate access point E-9. It will provide primary access from Lawrence, Kansas, and will serve the southern and eastern service entrances to the

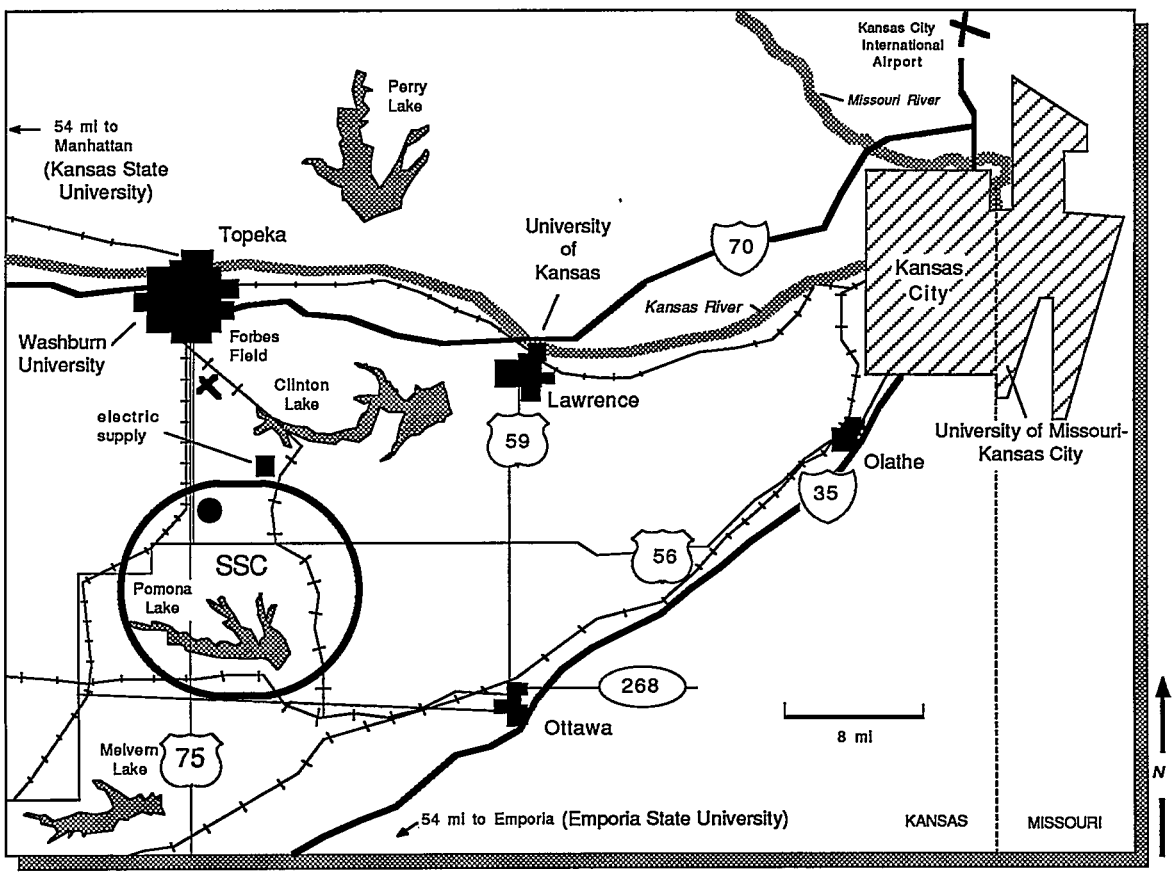


FIGURE 4.2—TRANSPORTATION NETWORK IN THE VICINITY OF THE SSC SITE.

main campus.

The design capacity of these roads greatly exceeds their current and projected utilization, and neither construction nor operational uses associated with the SSC will exceed their design capacities (Table 4.2).

The project area is also served by an existing, well-developed system of local county and township roads. These are generally gravel, all-weather surfaces laid out in a north-south, east-west grid system every square mile. As a result, the entire ring is readily accessible for both construction and operation. Figure 4.3 indicates the proposed use of the existing local road system for tunnel-spoils haul and construction and operational access. The existing road system could support construction in its present condition; modest upgrades will improve access to selected spoils-disposal points.

The site is also accessible by existing railroads (Figure 4.2 and Plate 4.1 [in back envelope]). Mainlines of the Atchison, Topeka & Santa Fe and Missouri Pacific railroads intersect the site near the main campus and far cluster. The AT&SF line which intersects the ring just east of external beam access point J-3 runs directly north to the industrial area adjacent to Forbes Field. Construction equipment or large components such as the detector components can be moved from Missouri River barge facilities at Kansas City to the site, utilizing the capacity of these rail lines.

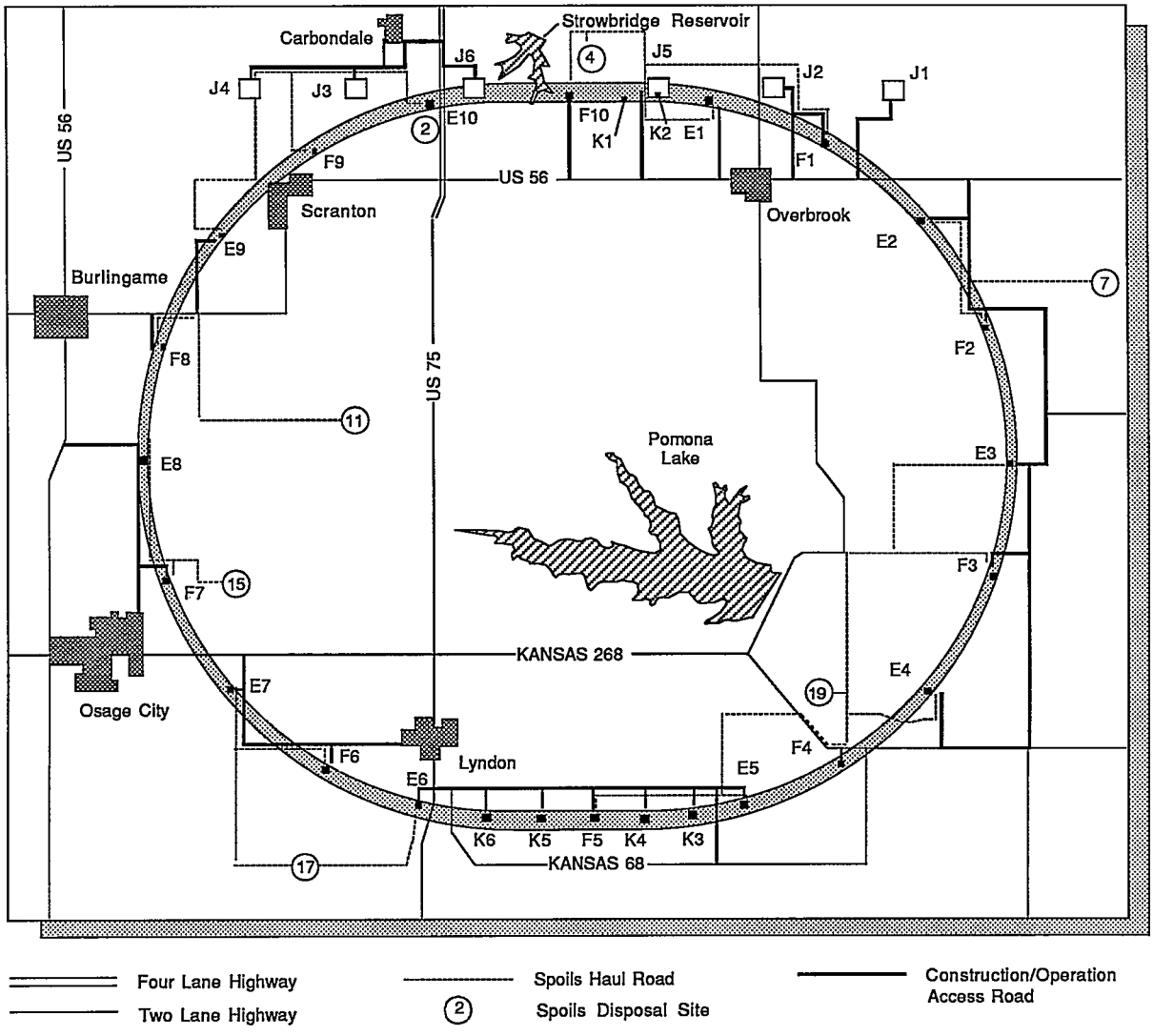


FIGURE 4.3—LOCAL ACCESS AND HAUL ROADS FOR THE SSC SITE.

4.2.2 Transportation System Improvements

Kansas will invest over $21 million in highway and local road improvements to meet ISP requirements; provide a short-haul, low-cost spoils-disposal road system; assist Osage, Douglas, and Franklin counties in maintaining their roads during construction; and provide the SSC facility with an all-weather access-road system upon completion of construction.

The main campus site plan described in Section 6.1.1 and illustrated in Plate 6.1 includes a four-lane access road extending from U.S. Highway 75 at Carbondale, turning south and winding along the west edge of Strowbridge Reservoir to the main campus. Kansas will construct a four-lane, divided and landscaped parkway from U.S. Highway 75 at the City of Carbondale to the intersection of the campus loop road as shown on Plate 6.1. This facility represents a $9.3-million infrastructure investment to improve traffic flow from U.S. Highway 75 to the main campus.

Kansas will invest an additional $3.9 million to provide a four-lane southern access from U.S. Highway 56 to the main campus loop and an improved two-lane service access from U.S. Highway 56 to the warehouse and heavy-works areas on the west side of the main campus. These facilities, illustrated in Plate 6.1, will improve traffic flows for both SSC staff and area residents, thus minimizing the impact of the facility upon current traffic patterns within Osage County.

Selected improvements in the existing system of local county roads will be made prior to, during, and following construction. The State of Kansas has reached agreement with each of the affected counties to undertake these improvements at State expense (volume 4, appendix

TABLE 4.2—VEHICULAR CAPACITY OF MAJOR ROADS AND HIGHWAYS (SEE ALSO FIGURE 4.2); SOURCE—KANSAS DEPARTMENT OF TRANSPORTATION.

Highway/Section	Lanes	Daily Capacity	Average Daily Traffic	Average Ratio		
				Peak Hour Capacity	Peak Hour Volume	Volume To Capacity
Interstate 70 Kansas City to Topeka	4	36,042	17,022	3,784	1,787	0.47
Interstate 470 Around Topeka	4	35,756	11,116	3,397	1,056	0.31
US Highway 75 I-470 to US-56	4	32,938	10,057	3,458	1,056	0.31
US Highway 75, Existing Cond. US-56 to I-35	2	8,290	3,240	953	373	0.39
US Highway 75 Improved Cond. US-56 to I-35	2	11,000	3,912	1,265	450	0.36
US Highway 56 Existing Cond. US-75 to east of site	2	5,011	1,780	636	226	0.36
US Highway 56 Improved Cond. US-75 to east of site	2	11,000	2,255	1,397	286	0.21

1). Prior to and during the earliest stages of construction, Kansas will provide $6.5 million in grading, culvert and road-surface widening, and surface enhancement to selected sections of the existing Osage, Franklin, and Douglas county road systems which will serve as spoils-haul and heavy-construction access roads (Figure 4.3)

Upon completion of construction, these roads will either be returned to their pre-construction condition or further improved to serve as site-access roads for facility operation. These post-construction investments are currently estimated at $1.5 million.

Design and construction timing details for these infrastructure improvements will be developed in consultation with DOE contractors.

4.3 PUBLIC TRANSPORTATION

4.3.1 Description of Public Transportation

The low population densities and well-developed road systems which characterize the Kansas site and surrounding communities have largely obviated the need for mass transit in the region. Metropolitan Kansas City and Topeka operate intra-city metropolitan transit systems including "park and ride" commuter services, but these do not currently provide access to the site.

Regularly scheduled transit between Lawrence, Kansas, and the Kansas City International Airport is provided on a limited basis, but surface transportation between KCI and Topeka is currently available only by charter. KCI is served from Topeka's Forbes Field by regularly scheduled commuter air service operated by Braniff and Eastern Airlines.

At present, transportation between the region's airports and local communities is accomplished by private or rental automobile. KCI and Forbes Field are effectively served by all major national rental-car companies.

Regional intercity bus transportation is provided between Kansas City, Lawrence, Topeka, Manhattan, and Wichita by both Trailways and Greyhound Bus Lines, and Lawrence and Topeka are linked to Kansas City by Amtrak service.

4.3.2 Public Transportation Improvements

No investments in mass-transportation capacity are contemplated at present. Preliminary discussions with airline and rental-car company representatives have been undertaken, and proposers believe these service providers are prepared to respond to demand as it occurs.

The Kansas SSC Project Office and the Kansas Department of Transportation will monitor actual and projected demand in close coordination with DOE's project-management team and are prepared to stimulate private providers to insure capacity when needed.

4.4 INDUSTRIAL AND CONSTRUCTION RESOURCES

4.4.1 Accessibility of Industrial Base

The proposed Kansas site has ready access to an industrial base capable of handling the construction and operation of the Super Collider facilities. The economy of the region also provides opportunities for employment of family members of SSC personnel.

Primary population centers and industrial/economic activities are concentrated in the Kansas City, Lawrence, Topeka, and Wichita Metropolitan Statistical Areas.

The economic composition of the metropolitan industrial bases within the vicinity is shown in Table 4.3. The table shows the actual and proportional number of persons employed, annual payroll, and the number of establishments, by economic sector based on Standard Industrial Classifications. The table, derived from 1985 U.S. Census data, presents data for the Kansas City, Lawrence, Topeka, and Wichita metropolitan areas. While Wichita is not in the immediate vicinity of the proposed SSC facility, it is located just outside of the 100-mile vicinity range and is a principal regional economic center with substantial assets to support construction.

Contracting, manufacturing, process, and building-trade firms involved with construction enterprises which might be engaged in supporting the SSC project are described in Table 4.4. The table shows the number of establishments, the number of employees, and the size of the payroll for construction firms in major metropolitan areas in the vicinity. Some of the information for Table 4.4 is not reported precisely by the U.S. Census to protect the privacy of the firm. In such cases, the size of the firm or its payroll is usually indicated by a range of employees or dollars. The number reported in this table is the low number of the range and identified by a plus sign ("+"). Other data not included in the Census are identified by the symbol (D).

Ample construction resources exist within the region to support the construction and operation of the SSC. Several large construction companies are based in the region, including the Martin Eby Construction Company of Wichita, one of the nation's top 100 largest construction companies. Cement is an export product of Kansas, and temporary concrete batch plants are available for on-site production of concrete. Construction aggregates are naturally abundant throughout the region. Kansas Department of Transportation geotechnical and

TABLE 4.3—ECONOMIC STRUCTURE OF MAJOR COMMUNITIES IN THE SSC VICINITY, KANSAS AND MISSOURI. COUNTY BUSINESS PATTERNS, U.S. BUREAU OF CENSUS.

	# of Employ. for Week Including March 12, 1985	Annual Payroll ($1,000)	Number of Establish-ments	% Employ. in Industry	% Establish-ments
KANSAS CITY MSA					
Agricultural services, & forestry, fisheries	1,811	22,263	330	0.31	0.93
Mining	852	21,066	68	0.15	0.19
Contract construction	30,949	788,122	2,871	5.28	8.09
Manufacturing	126,276	3,195,950	2,103	21.55	5.93
Transportation & other public utilities	40,539	1,034,402	1,152	6.92	3.25
Wholesale trade	51,714	1,194,821	3,399	8.83	9.58
Retail trade	118,043,325	1,315,127	8,096	20.15	22.82
Finance, insurance, and real estate	52,393	1,118,068	3,352	8.94	9.45
Services	157,055	2,456,505	11,251	26.81	31.71
Nonclassifiable establishments	6,245	80,508	2,854	1.07	8.04
KANSAS CITY TOTALS	585,877	11,226,832	35,476	100.00	100.00
TOPEKA, MSA					
Agricultural services, & forestry, fisheries	175	1,243	45	0.28	0.96
Mining	283	2,770	21	0.45	0.45
Contract construction	3,633	76,766	445	5.72	9.54
Manufacturing	9,555	227,485	161	15.05	3.45
Transportation & other public utilities	4,153	112,329	158	6.54	3.39
Wholesale trade	3,790	73,510	285	5.97	6.11
Retail trade	15,920	166,630	1,203	25.08	25.78
Finance, insurance, and real estate	5,807	103,099	454	9.15	9.73
Services	19,521	291,191	1,549	30.75	33.19
Nonclassifiable establishments	642	9,429	346	1.01	7.41
TOPEKA, MSA TOTALS	63,479	1,064,452	4,667	100.00	100.00
LAWRENCE, MSA					
Agricultural services, & forestry, fisheries	67	715	17	0.37	1.04
Mining	20	433	6	0.11	0.37
Contract construction	968	18,134	161	5.40	9.85
Manufacturing	4,047	85,593	79	22.57	4.83
Transportation & other public utilities	1,062	21,960	53	5.92	3.24
Wholesale trade	621	10,129	92	3.46	5.63
Retail trade	5,894	52,695	447	32.87	27.34
Finance, insurance, and real estate	876	13,656	125	4.89	7.65
Services	4,089	44,910	504	22.80	30.83
Nonclassifiable establishments	288	3,477	151	1.61	9.24
LAWRENCE MSA TOTALS	17,932	251,702	1,635	100.00	100.00

Table 4.3 (continued)

	# of Employ. for Week Including March 12, 1985	Annual Payroll ($1,000)	Number of Establish-ments	% Employ. in Industry	% Establish-ments
WICHITA, MSA					
Agricultural, services, & forestry, fisheries	421	4,853	111	0.22	0.95
Mining	6,126	164,085	344	3.21	2.95
Contract construction	9,268	192,064	1,079	4.86	9.26
Manufacturing	59,754	1,626,930	644	31.31	5.53
Transportation & other public utilities	11,049	254,089	392	5.79	3.37
Wholesale trade	12,061	267,308	952	6.32	8.17
Retail trade	36,684	384,751	2,806	19.22	24.09
Finance, insurance, and real estate	10,950	218,550	944	5.74	8.10
Services	42,717	631,999	3,460	22.39	29.70
Nonclassifiable establishments	1,797	20,588	916	0.94	7.86
WICHITA MSA TOTALS	190,827	3,765,217	11,648	100.00	100.00

TABLE 4.4—CONSTRUCTION-RELATED FIRMS WITHIN THE VICINITY; 1985 COUNTY BUSINESS PATTERNS FOR KANSAS AND 1985 COUNTY BUSINESS PATTERNS FOR MISSOURI, U.S. BUREAU OF CENSUS.

SIC Code	Industrial Classification Category	Number of Firms	Employees in Sector	Payroll ($1,000)
KANSAS CITY MSA CONSTRUCTION-RELATED FIRMS				
14	Mining & Quarrying of Nonmetallic Minerals Except Fuels	23	+416	+10,035
15	General Contractors - Operative Buildings	844	6,758	301,610
16	General Contractors - Other Than Buildings	188	+3,552	+47,940
17	Construction - Special Trade Contractors	1,886	20,197	493,444
24	Lumber & Wood Products, Except Furniture	82	1,332	22,692
30	Rubber & Miscellaneous Plastics Products	188	+4,622	+79,957
32	Stone, Clay, Glass, & Concrete Products	96	3,371	90,531
33	Primary Metal Industries	37	+3,474	+78,559
34	Fabricated Metal Products, Except Machinery & Transportation Equipment	200	+16,077	+402,829
35	Machinery, Except Electrical	265	7,029	169,688
36	Electrical & Electronic Machinery, Equipment & Supplies	118	+13,198	+310,787
37	Transportation Equipment	41	+12,520	+++(D)
38	Measuring, Analyzing & Controlling Instruments Photographic, Medical, Optical Goods	29	2,027	44,450
39	Miscellaneous Manufacturing Industries	72	+800	+13,123
42	Motor Freight Transportation & Warehousing	559	14,559	377,494
44	Water Transportation	4	+250	(D)
45	Transportation by Air	64	+5,800	+13,217

Table 4.4 (continued)

SIC Code	Industrial Classification Category	Number of Firms	Employees in Sector	Payroll ($1,000)
47	Transportation Services	229	1,765	31,939
50	Wholesale - Durable Goods	2,281	+29,464	+721,575
89	Engineering and Architectural Services	288	6,811	207,344
WICHITA CONSTRUCTION-RELATED FIRMS				
14	Mining & Quarrying of Nonmetallic Minerals Except Fuels	13	104	1,770
15	General Contractors - Operative Buildings	288	2,300	42,736
16	General Contractors - Other Than Buildings	60	1,953	49,104
17	Construction - Special Trade Contractors	731	5,015	100,225
24	Lumber & Wood Products, Except Furniture	15	203	3,107
30	Rubber & Miscellaneous Plastics Products	36	1,251	20,283
32	Stone, Clay, Glass, & Concrete Products	28	612	12,261
33	Primary Metal Industries	11	283	5,446
34	Fabricated Metal Products, Except Machinery & Transportation Equipment	63	+1,122	+21,523
35	Machinery, Except Electrical	114	+5,973	+128,588
36	Electrical & Electronic Machinery, Equipment & Supplies	20	639	15,479
37	Transportation Equipment	57	38,157	301,958
38	Measuring, Analyzing & Controlling Instruments Photographic, Medical, Optical Goods	19	+1,069	+19,807
39	Miscellaneous Manufacturing Industries	23	252	4,393
42	Motor Freight Transportation & Warehousing	187	1,957	40,602
44	Water Transportation	N/A	N/A	N/A
45	Transportation by Air	34	2,714	66,892
47	Transportation Services	46	+362	+4,991
50	Wholesale - Durable Goods	680	7,664	175,267
89	Engineering and Architectural Services	104	972	24,149
TOPEKA CONSTRUCTION-RELATED FIRMS				
14	Mining & Quarrying of Nonmetallic Minerals Except Fuels	3	+100	(D)
15	General Contractors - Operative Buildings	110	1,180	20,987
16	General Contractors - Other Than Buildings	24	592	17,431
17	Construction - Special Trade Contractors	275	1,768	36,543
24	Lumber & Wood Products, Except Furniture	N/A	N/A	N/A
30	Rubber & Miscellaneous Plastics Products	2	+2,500	(D)
32	Stone, Clay, Glass, & Concrete Products	10	151	3,215
33	Primary Metal Industries	2	+100	(D)
34	Fabricated Metal Products, Except Machinery & Transportation Equipment	14	201	4,286
35	Machinery, Except Electrical	18	348	8,623
36	Electrical & Electronic Machinery, Equipment & Supplies	6	145	2,137
37	Transportation Equipment	N/A	N/A	N/A
38	Measuring, Analyzing & Controlling Instruments Photographic, Medical, Optical Goods	N/A	N/A	N/A
39	Miscellaneous Manufacturing Industries	N/A	N/A	N/A
42	Motor Freight Transportation & Warehousing	65	506	9,923
44	Water Transportation	N/A	N/A	N/A
45	Transportation by Air	N/A	N/A	N/A

Table 4.4 (continued)

SIC Code	Industrial Classification Category	Number of Firms	Employees in Sector	Payroll ($1,000)
47	Transportation Services	14	132	2,168
50	Wholesale - Durable Goods	162	1,927	41,097
89	Engineering and Architectural Services	36	399	9,593
LAWRENCE CONSTRUCTION-RELATED FIRMS				
14	Mining & Quarrying of Nonmetallic Minerals Except Fuels	N/A	N/A	N/A
15	General Contractors - Operative Buildings	48	194	3,505
16	General Contractors - Other Than Buildings	8	158	3,424
17	Construction - Special Trade Contractors	105	616	11,204
24	Lumber & Wood Products, Except Furniture			
30	Rubber & Miscellaneous Plastics Products	3	+250	(D)
32	Stone, Clay, Glass, & Concrete Products	6	62	1,337
33	Primary Metal Industries	1	+100	(D)
34	Fabricated Metal Products, Except Machinery & Transportation Equipment	N/A	N/A	N/A
35	Machinery, Except Electrical	N/A	N/A	N/A
36	Electrical & Electronic Machinery, Equipment & Supplies	5	57	603
37	Transportation Equipment	3	+100	(D)
38	Measuring, Analyzing & Controlling Instruments Photographic, Medical, Optical Goods	4	98	1,417
39	Miscellaneous Manufacturing Industries	6	79	1,188
42	Motor Freight Transportation & Warehousing	21	141	2,853
44	Water Transportation	N/A	N/A	N/A
45	Transportation by Air	N/A	N/A	N/A
47	Transportation Services	10	+100	(D)
50	Wholesale - Durable Goods	59	05	6,872
89	Engineering and Architectural Services	15	69	1,597

materials-testing reports show ample natural deposits of aggregates in the counties around the SSC site. Much of the construction steel used in the state is produced in Kansas City; Tulsa, Oklahoma; and Pueblo, Colorado. Several highly qualified steel-fabrication and erection companies operate from within the region.

A growing industry in Wichita is the development and application of composite materials, particularly in the manufacture of aircraft. For example, the Beech Aircraft Company is using the new materials in its new business-class aircraft, the Starship.

Electrical and electronic firms are numerous in the region as are high-technology firms (volume 4, appendix 2).

Industrial gases are plentiful. Kansas is a world leader in the production of helium; 1985 production of grade A helium, as reported by the U.S. Bureau of Mines, was 1.115 billion cubic feet. Helium, nitrogen, oxygen, and other industrial gases are available from several commercial suppliers in Kansas City. Some of these firms have the capacity to install on-site atmospheric-nitrogen-extraction facilities, if warranted.

Recent construction within the region has been extensive, including several heavy-works and high-technology projects. Tables 4.5 and 4.6 show recent construction activity in selected metropolitan areas. See also volume 4, appendix 3.

The Kansas Department of Transportation regularly evaluates construction contractors to pre-qualify them for bidding on highway construction projects. In July 1987, there were 432 contractors pre-qualified by the KDOT to undertake highway-construction work amounting to approximately $6.2 billion.

TABLE 4.5—NON-RESIDENTIAL CONSTRUCTION IN THE VICINITY, DODGE CONSTRUCTION POTENTIALS BULLETINS. F.W. DODGE DIVISION OF MCGRAW-HILL, INFO. SYSTEMS CO.

	Kansas City		Topeka		Wichita		Lawrence	
Year	(SF)	($1M)	(SF)	($1M)	(SF)	($1M)	(SF)	($1M)
1986	12860	$796.5	680	$49.3	1910	$129.1	720	$34.8
1985	12200	$779.7	350	$41.8	2220	$138.4	840	$33.6
1984	9070	$776.1	1070	$56.7	2200	$132.1	270	$15.4
1983	8460	$541.1	1110	$79.6	2560	$146.1	170	$8.7

Area is expressed as Thousands of Square Feet
Value is in millions of dollars.

TABLE 4.6— RECENT HEAVY- AND LARGE-CONSTRUCTION PROJECTS IN THE VICINITY.

Project	Construction Location	Budget Period	Labor ($1M)	Force
Wolf Creek Generating Station	Coffey County	May 1977 to Sept. 1985	$3,050.0	5018
Jeffrey Energy Center	Pottawatomie County	June 1974 to Oct. 1983	$1,032.0	2800
La Cygne Energy Center, Projects 1,2	Linn County	April 1973 to May 1977	$430.0	N/A
AT&T Office Building	Kansas City Missouri	July 1984 to Feb. 1987	$120.0	500
One Kansas City Place Office Building	Kansas City, Missouri	July 1985 to November 1987	$65.0	375
Kansas Expo Center	Topeka, Kansas	March 1985 to March 1987	$20.0	N/A
Macdonald Laboratory Linear Accelerator	Kansas State University	under construction	State $1.1 Fed. $3.5	N/A
Board of Regents' Institutions	State of Kansas	under construction or design	$142.7	N/A
Board of Regents' Institutions	State of Kansas	completed since 1979	$190.0	N/A

4.4.2 Labor Pool and Wage Rates

The region can supply a sufficient labor force to meet construction requirements. Tables 4.3, 4.4, and 4.5 indicate the extent of economic activity and construction related firms currently operating in the region, and Table 4.6 provides a sample of recent high-technology heavy-works projects and the work forces associated with them. The Wolf Creek Generating Station, a nearby nuclear power plant, was completed in 1985 and utilized a work force of over 5,000. Many workers from within and beyond the region migrated to the project area and

TABLE 4.7—TYPICAL WAGE RATES IN THE PROPOSED SSC REGION. (DATA FROM KANSAS DEPARTMENT OF HUMAN RESOURCES; REPORT SERIES #15, APRIL 1987).

	Northeast Kansas Area Eexcluding Metropolitan Kansas City Area		Kansas City, Kansas Metropolitan Area	
	Majority Range per Hour	Complete Range per Hour	Majority Range per Hour	Complete Range per Hour
	$	$	$	$
Accountant	10.75-11.83	3.35-19.27	10.75-11.83	6.03-55.54
Administrative Assistant	8.86- 9.75	3.35-26.41	9.76-10.74	3.70-36.06
Assembler, Heavy	8.86- 9.75	4.96-14.33	7.31- 8.04	50-22.00
Bookkeeper	6.03- 6.63	3.35-13.02	6.64- 7.30	3.35-17.25
Carpenter	9.76-10.74	6.03-14.33	9.76-10.74	7.31-19.35
Carpenter, Rough	7.31- 8.04	5.47-10.74	N/A	N/A
Clerk, Accounting	6.03- 6.63	3.35-13.02	7.31- 8.04	3.70-24.04
Clerk, Administrative	6.64- 7.30	3.35-13.02	6.64- 7.30	4.08-16.54
Clerk, Billing	5.47- 6.02	3.70-10.74	6.64- 7.30	4.08-16.54
Clerk, File	4.96- 5.46	3.35- 7.30	5.47- 6.02	3.35-10.74
Clerk, General	5.47- 6.02	3.35-11.83	5.47- 6.02	3.35-14.33
Clerk, Production	6.64- 7.30	4.50-11.83	7.31- 8.04	4.05-15.00
Clerk, Sales	4.50- 4.95	3.35-10.74	4.50- 4.95	3.35-14.34
Clerk, Shipping & Receiving	6.03- 6.63	3.35-13.02	6.64- 7.30	3.35-17.68
Clerk, Stock	6.03- 6.63	3.35-11.83	6.03- 6.63	3.35-14.63
Computer Operator	7.31- 8.04	4.08-20.20	8.05- 8.85	3.70-20.33
Construction Worker I	6.03- 6.63	4.08-11.83	8.05- 8.85	4.08-15.30
Data Entry Operator	5.47- 6.02	3.70-13.02	6.03- 6.63	3.75-14.33
Drafter	8.05- 8.85	4.50-16.05	8.86- 9.75	4.96-19.75
Electrician	9.76-10.74	6.03-16.88	9.76-10.74	5.47-57.00
Foundry Worker, General	8.05- 8.85	4.50-10.74	N/A	N/A
Industrial Engineer	11.84-13.02	6.64-21.08	11.84-13.02	6.64-36.20
Industrial Truck Operator	8.86- 9.75	4.08-14.33	8.86- 9.75	4.08-14.33
Machinist	9.76-10.74	4.08-15.62	9.76-10.74	4.96-17.00
Manager, Office	8.86- 9.75	3.35-28.85	10.75-11.83	5.47-27.50
Mechanic, Automobile	8.05- 8.85	3.35-14.33	9.76-10.74	4.96-15.36
Mechanic, Diesel	8.05- 8.85	4.08-14.33	9.76-10.74	5.47-16.77
Mechanic, Maintenance	9.76-10.74	4.08-14.47	9.76-10.74	3.70-18.03
Painter	8.05- 8.85	4.50-14.33	8.86- 9.75	6.03-18.60
Painter, Spray	6.64- 7.30	3.35-14.33	6.64- 7.30	4.08-10.74
Plumber	10.75-11.83	5.47-19.00	10.75-11.83	7.31-19.92
Purchasing Agent	9.76-10.74	4.50-22.85	10.75-11.83	4.96-44.20
Receptionist	4.96- 5.46	3.35- 9.75	6.03- 6.63	3.35-14.34
Secretary	6.03- 6.63	3.35-13.02	7.31- 8.04	3.35-14.86
Truck Driver, Heavy	8.05- 8.85	4.50-14.34	7.31- 8.04	3.35-14.81
Typist	4.96- 5.46	3.35- 8.85	6.03- 6.63	3.70-10.74
Welder, Combination	8.05- 8.85	4.50-14.33	8.86- 9.75	4.96-16.08

established temporary residence. Many of these remain in the communities within easy commuting distance of the SSC.

The recent decline in the farm sector and associated supporting business and industries has added a substantial number of former farmers and farm workers to the regional labor pool. These individuals are adapt at a wide variety of job skills, self motivated, and accustomed to hard work. Their presence in the labor pool is masked by the fact that current unemployment statistics methodologies systematically undercount them.

Kansas' work force is well educated and dependable and Kansas workers add $4.43 of value per dollar of payroll. In 1984, 12.8% of the manufacturing work force were union members. A right-to-work state, Kansas enjoys an excellent reputation for sound labor-management relations.

The state has a well-established network of training institutions and opportunities. With six Area Vocational-Technical Schools (AVTS) located in Topeka, Emporia, Manhattan, Atchison, Olathe, and Kansas City, Kansas, there is a strong commitment of resources in the vicinity of the site for vocational-technical education. These schools regularly instruct individuals in on-site training programs for industry and government. In the past five years, the state system of 16 AVTS has provided vocational-education opportunities for 184,260 secondary, post-secondary, and adult students. In 1986, the AVTS system served 5,832 employees of 60 businesses and industries through 85 programs. Vocational-technical education is also delivered through a state-wide system of 19 public community colleges.

The Kansas Department of Commerce, in coordination with the State Department of Education, offers a customized training program for industry through the Kansas Industrial Training Program. The KIT program coordinates both resources and the delivery system of specialized training programs for businesses locating or expanding in the state.

The State of Kansas will provide $500,000 per year during the anticipated six-year construction period to assist DOE's contractors in the training and development of their work forces. This commitment will be implemented through the Kansas Industrial Training program, which will coordinate the state's training resources to most effectively meet the needs of the contractors.

4.5 HUMAN RESOURCES

4.5.1 Population Distribution of the Vicinity

The vast majority of the population within one-hour's driving time of the proposed site is found along the Interstate 70 highway corridor running east-west across Kansas and passing within 30 miles of the proposed site. Kansas City, Missouri, and the major Kansas communities of Kansas City, Lawrence, Topeka, and Manhattan are all located along I-70, within an hour of the proposed site. The locations and populations of the cities and communities in the vicinity are summarized in Table 4.8 and Table 4.9 and Figures 4.4 and 4.5. More information on towns and populations within the vicinity is shown in volume 4, appendix 4.

TABLE 4.8–POPULATION OF THE SURROUNDING COUNTIES, 1980 U.S. CENSUS OF POPULATION.

County	County Seat	Population
Anderson	Garnett	8,749
Coffey	Burlington	9,370
Douglas	Lawrence	67,640
Franklin	Ottawa	22,062
Jackson	Holton	11,644
Jefferson	Oskaloosa	15,207
Johnson	Olathe	270,269
Leavenworth	Leavenworth	54,809
Lyon	Emporia	35,108
Osage	Lyndon	15,319
Pottawatomie	Westmoreland	14,782
Shawnee	Topeka	154,91
Wabaunsee	Alma	6,867

TABLE 4.9—CITIES OF 5,000 OR MORE POPULATION WITHIN 100 MILES OF THE SSC VICINITY, KANSAS DEPARTMENT OF TRANSPORTATION AND MISSOURI HIGHWAY DEPARTMENT.

City	Road Miles from North Campus	Road Miles from South Cluster	Population 1980 U.S. Census	Direction from SSC Ring
Atchison, KS	85	97	11,407	N
Belton, MO	78	90	12,708	E
Blue Springs, MO	94	105	25,927	NE
Bonner Springs, KS	65	71	6,266	NE
Chanute, KS	90	78	10,506	S
Emporia, KS	50	38	25,287	SW
El Dorado, KS	106	94	10,510	SW
Gladstone, MO	76	88	24,990	NE
Grandview, MO	82	94	24,561	E
Harrisonville, MO	96	108	6,372	E
Independence, MO	93	105	111,806	NE
Iola, KS	83	71	6,938	S
Junction City, KS	90	102	19,305	W
Kansas City, KS	74	86	161,087	NE
Kansas City, MO	78	90	448,159	NE
Lansing, KS	69	81	5,307	NE
Lawrence, KS	36	48	52,738	NE
Leavenworth, KS	74	86	33,656	NE
Leawood, KS	74	86	13,360	NE
Lee's Summit, MO	84	96	28,741	E
Lenexa, KS	65	77	18,639	NE
Liberty, MO	93	105	16,251	NE
Manhattan, KS	72	84	32,644	NW
Merriam, KS	70	82	10,794	NE
Mission, KS	74	86	8,643	NE
Olathe, KS	51	63	37,258	E
Ottawa, KS	39	27	11,016	E
Overland Park, KS	68	80	81,784	E
Prairie Village, KS	73	85	24,657	NE
Raytown, MO	89	101	31,831	E
Roeland Park, KS	74	86	7,962	NE
Shawnee, KS	65	77	29,653	NE
Topeka, KS	21	33	115,266	N

4.5.2 Communities within One-hour Driving Time of the SSC Site

The communities within roughly an hour's driving time of the proposed site are listed below.

Baldwin City	Gardner	Mission	Shawnee
Bonner Springs	Kansas City, KS	Olathe	St. Marys
Burlingame	Kansas City, MO	Osage City	Topeka
Carbondale	Lawrence	Ottawa	Wamego
Council Grove	Leavenworth	Overland Park	Lenexa
Emporia	Manhattan	Paola	Merriam
Prairie Village			

4.5.3 Local Employment Rates and Opportunities

Employment rates and employment opportunities in the vicinity of the proposed site are favorable. The major urban areas of metropolitan Kansas City and its suburbs, and Lawrence, Topeka, and Manhattan all offer a variety of employment opportunities.

Particularly noteworthy is the growing economy of nearby Johnson County, a 40-minute commute from either Lawrence or Ottawa. Johnson County's unemployment rate is 2.8% and the county enjoys one of the highest

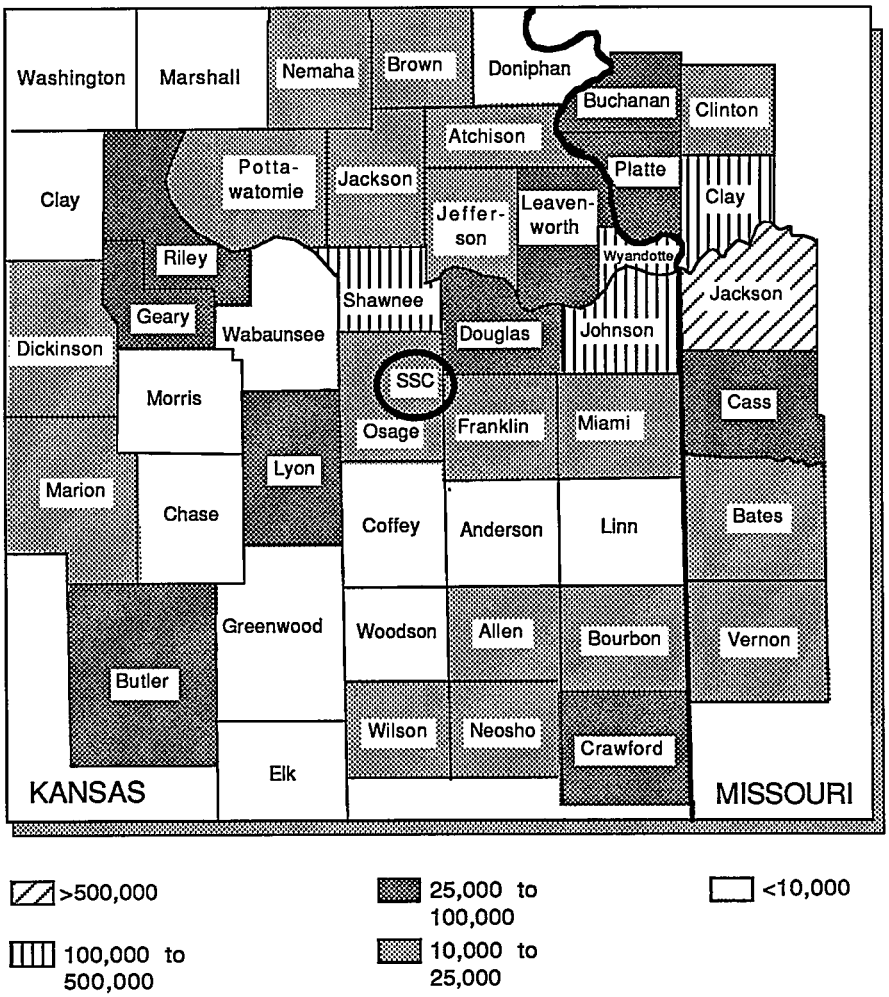


FIGURE 4.4—POPULATION DENSITY OF THE SURROUNDING COUNTIES.

economic-expansion rates in the country. The growth is characterized by a steady rise in the number of small- and medium-size companies. Manufacturing employment has quadrupled in the past 20 years. For example, the number of printing and publishing firms has risen from 25 in 1965 to 127 in 1985. Electrical and electronic manufacturers have increased from 12 to 52 in the same period.

In addition, many smaller communities have extensive agricultural, commercial, and light-industrial resources. Kansas City, Lawrence, and Manhattan all host large universities. Topeka, Emporia, and Ottawa also host universities; community colleges and vocational/technical schools are also located in these and other communities in the area.

The economic base of the area has the potential for employment opportunities for family members of SSC personnel. The characteristics of general economic sectors (based on first-order Standard Industrial Classification categories) are reported in Table 4.3.

Employee, firm, and payroll data are from 1985 Kansas County Business Patterns from the U.S. Bureau of Census and are shown in Table 4.10.

More detailed data for the largest employers in the principal cities of the counties surrounding the SSC site (firms employing 10 or more persons) are provided from the Dunn and Bradstreet Million Dollar Directory and the Kansas Department of Commerce. This detailed listing of the individual firms is shown in volume 4, appendix 5, by name, city, number of employees, size of payroll, product or service provided, and SIC code.

Representative professional employment currently within the vicinity is illustrated by classification, number of employees, annual payroll, and number of firms providing professional services (Table 4.11).

4.5.4 Equal Employment Opportunity

The Kansas Act Against Discrimination was passed in 1953, placing Kansas among the first states to adopt such legislation. In 1961, the law was amended to provide the Kansas Commission on Civil Rights with the necessary powers to enforce the provisions of the Act, which prohibits discrimination on the basis of race, religion, color, sex, physical handicap, national origin,

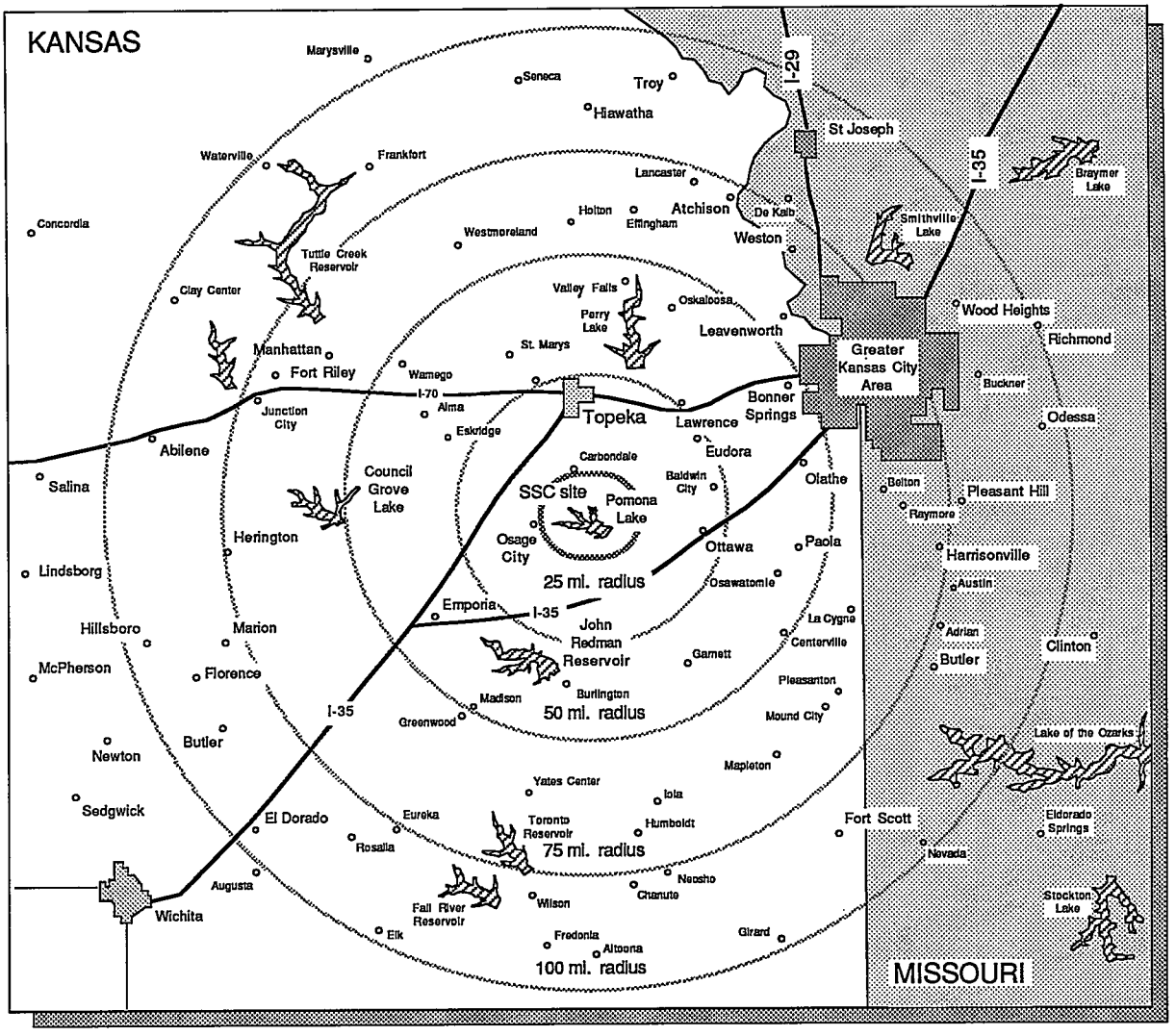


FIGURE 4.5—CITIES IN THE VICINITY OF THE PROPOSED SITE.

ancestry, and age, in the areas of employment, housing, and public accommodations. Thus, the efforts of the State of Kansas to eliminate offensive discrimination predate the Federal Civil Rights Law of 1964.

The Act includes in its definition of "employers" the State of Kansas and all political and municipal subdivisions thereof. It also requires that every contract for or on behalf of the state, or any county, municipality, or other political subdivision, or any agency thereof, shall contain provisions by which the contractor agrees to observe the provisions of the Act, and further provides that violations of the Act shall be deemed breaches of such contracts.

The Commission's investigative tools include the authority to issue subpoenas and a provision for obtaining search warrants if necessary. The Commission is a 706 Agency under the provisions of Title VII of the Civil Rights Act of 1964 and is certified by the Equal Employment Opportunity Commission, indicating that the Commission rigorously and effectively enforces the Kansas Act Against Discrimination. It is to be noted that the Commission enjoys similar relations with the Department of Housing and Urban Development. Kansas realtors and lending institutions regularly exercise open and fair housing practices.

TABLE 4.10—EMPLOYMENT IN SELECTED COUNTIES WITHIN ONE-HOUR'S DRIVING TIME OF THE SSC, 1985 KANSAS COUNTY BUSINESS PATTERNS, U.S. BUREAU OF CENSUS; KANSAS DEPARTMENT OF HUMAN RESOURCES.

County	County Seat	No. of Employees in Firms in County	No. of Firms in County	Annual Payroll	Unemploy. Rate
Johnson	Olathe	130,013	9,571	$2,439,154,000	2.8%
Shawnee	Topeka	60,409	4,153	$1,032,261,000	5.1%
Douglas	Lawrence	17,932	1,635	$251,703,000	3.0%
Lyon	Emporia	11,889	881	$183,265,000	6.1%
Leavenworth	Leavenworth	9,523	857	$127,861,000	4.4%
Franklin	Ottawa	4,411	472	$50,163,000	7.0%
Pottawatomie	Westmoreland	2,597	323	$37,830,000	5.2%
Coffey	Burlington	1,761	221	$37,700,000	9.4%
Osage	Lyndon	1,712	267	$18,811,000	6.6%
Jackson	Holton	1,318	226	$13,262,000	8.0%
Jefferson	Oskaloosa	1,308	267	$16,126,000	6.2%
Anderson	Garnett	1,161	190	$12,768,000	8.0%
Wabaunsee	Alma	595	130	$5,475,000	6.0%

TABLE 4.11— PROFESSIONAL EMPLOYMENT WITHIN COUNTIES SURROUNDING THE SSC, KANSAS COUNTY BUSINESS PATTERNS, U.S. BUREAU OF CENSUS.

SIC Code	Industrial Classification	Number of Employees	Annual Payroll	Total Firms
	JOHNSON COUNTY			
6011-6799	Finance, insurance, & real estate	15,468	$326,452,000	1,135
7300	Business services	8,651	$156,570,000	665
8000	Health services	7,506	$144,749,000	650
8100	Legal services	717	$17,374,000	162
8600	Non-profit membership organizations	2,301	$23,650,000	210
8911	Engineering & architectural services	1,340	$43,253,000	116
8922-8999	Other professional services	1,098	$22,155,000	226
	SHAWNEE COUNTY			
6011-6799	Finance, insurance, & real estate	5,614	$100,212,000	424
7300	Business services	2,733	$ 35,228,000	184
8000	Health services	7,542	$146,214,000	265
8100	Legal services	607	$11,808,000	122
8600	Non-profit membership organizations	2,101	$23,549,000	257
8911	Engineering & architectural services	399	$9,593,000	36
8922-8999	Other professional services	559	$11,758,000	54
	DOUGLAS COUNTY			
6011-6799	Finance, insurance, & real estate	876	$13,656,000	125
7300	Business services	688	$8,072,000	65
8000	Health services	808	$12,453,000	98
8100	Legal services	83	$1,186,000	27
8600	Non-profit membership organizations	371	$2,884,000	62
8911	Engineering & architectural services	69	$1,597,000	15
8922-8999	Other professional services	71	$1,044,000	22

Table 4.11 (continued)

SIC Code	Industrial Classification	Number of Employees	Annual Payroll	Total Firms
	LYON COUNTY			
6011-6799	Finance, insurance, & real estate	591	$9,616,000	68
7300	Business services	285	$2,841,000	34
8000	Health services	835	$12,073,000	65
8100	Legal services	57	$ 1,019,000	20
8600	Non-profit membership organizations	406	$2,214,000	31
8911	Engineering & architectural services	399	$9,593,000	36
8922-8999	Other professional services	19	$1,532,000	100
	FRANKLIN COUNTY			
6011-6799	Finance, insurance, & real estate	213	$3,310,000	37
7300	Business services	83	$1,307,000	13
8000	Health services	208	$2,225,000	27
8600	Non-profit membership organizations	100	$494,000	25
8922-8999	Other professional services	+20	(D)	35
	OSAGE COUNTY			
6011-6799	Finance, insurance, & real estate	18	$1,474,000	109
8000	Health services	14	$ 2,238,000	236
8600	Non-profit membership organizations	11	$140,000	124
	COFFEY COUNTY			
011-6799	Finance, insurance, & real estate	76	(D)	14
14 8000	Health services	117	$1,061,000	7
	WABAUNSEE COUNTY			
6011-6799	Finance, insurance, & real estate	49	$773,000	8
8000	Health services	127	$748,000	6

4.6 HOUSING

4.6.1 Characterization of Housing in the Vicinity

Housing opportunities exist within a convenient 50-mile driving radius of the ring. The area is made up of small communities, moderate-sized towns, and cities, as well as rural villages and lake developments. Existing housing will accommodate the construction phase. Current information indicates a range of five to nine percent vacancy in both rentals and new homes for sale. This level of vacancy gives the SSC staff choices in both the existing homes market and new subdivision development. Mobile-home lots are plentiful, and this housing type is well accepted in communities of the area. Existing houses found in the area tend toward one- and two-story, wood-frame and some masonry veneer, built between 1900 and the 1940s, in addition to recent housing from the 1950s to the present.

Experienced on-site builders are plentiful in the region for construction of conventional and custom dwellings. Land is available and in-place infrastructure in the surrounding communities will have no problem in immediately accommodating new housing developments.

4.6.2 Typical Housing Prices and Rental Levels

Rental rates for houses, apartments,and mobile-home lots may vary considerably from small towns to larger cities; however, eastern Kansas housing-rental prices are well below national averages. Average sale prices for single-family homes vary depending on size,

TABLE 4.12—MEDIAN RENTS BY COUNTY IN THE VICINITY.

County	1980 Population	1980 Median Rent	1986 Adjusted Median Rent
Coffey	9,370	$229	$335
Douglas	67,640	$246	$359
Franklin	22,062	$184	$269
Lyon	35,108	$205	$300
Osage	15,319	$172	$251
Shawnee	154,916	$224	$327
Wabaunsee	6,867	$169	$247

amenities, lot character and size, and the community or city in question. A recent survey of small- and moderate-sized towns finds the average home priced at the mid-$50,000s. In Topeka, Lawrence, and Overland Park, this single-family home will cost $60,000-70,000. In comparison, fourth-quarter 1986 averages in Kansas City were $65,100, and the national average was $80,100.

Housing-rental costs near the proposed SSC site are significantly less than the 1980 national median rent of $243/month or the 1986 adjusted average of $355/month (Table 4.12). Of the counties surrounding the SSC, only Douglas County, which includes Lawrence and the University of Kansas, with a 1986 adjusted median rent of $359/month, is over the national adjusted average, though by only four dollars. In primarily agricultural Wabaunsee County, northwest of the site, the adjusted median rent is $247/month. However, the supply of existing rental units there is far less than in Douglas County.

4.7 COMMUNITY SERVICES

4.7.1 Medical Resources

The Topeka-Kansas City area is a highly developed source of medical research, teaching, and service. Two major medical centers are within 15 miles of the proposed SSC site, and Kansas City hosts the University of Kansas Medical Center, the University of Missouri School of Medicine at Kansas City, and an Osteopathic School of Medicine. The Menninger Foundation, located in Topeka, is recognized around the world as a leading mental-health research and treatment institution.

The University of Kansas Medical Center (approximately 65 miles from the SSC) in Kansas City, Kansas, has complete care capabilities for trauma, burns, coronary organ transplant, and other major medical needs and is considered a tertiary-care facility for patients. This care includes complete diagnostic and therapeutic procedures, including the adequate management of complications without transfer of such patients to other hospitals.

Within a 100-mile radius from the proposed SSC, there are 74 hospitals with more than 13,851 beds collectively, 34,212 employees, and $1.36 billion in expenditures. Topeka alone offers more than 2,400 beds including the 365-bed St. Francis, the 305-bed Stormont-Vail, the 868-bed Colmery-O'Neil Veterans Administration Hospital, the 403-bed Topeka State Mental Hospital, and the 311-bed Memorial Hospital. Open-heart surgery, organ-transplant, arterial laser catheterization, burn-treatment, CT scanners, and MRI facilities are among the available services in Topeka.

Air-ambulance services provide emergency transportation to Topeka's three emergency departments including St. Francis Hospital and Medical Center's Trauma Unit and the Stormont-Vail Regional Medical Center Neonatology Nursery. Kansas City hospitals, within 70 miles of the proposed campus, also provide air ambulances, and the Fort Riley U.S. Army base currently supplements these services with its emergency helicopters.

Per capita expenditures in Kansas for all health services were $1.375 in 1984. This is 12.4 percent below the national per capita average (Figure 4.6). Kansas has consistently maintained a lower rate of per capita expenditures than the national average. The per capita expenditures for hospital care and physicians' services have both increased over the last several years, but at a slower rate than the national average (see Figures 4.7 and 4.8; source: "Health Care Expenditures in Kansas, 1966 to 1984, Kansas Department of Health and Environment). Third-party reimbursement options for health care include a range of conventional indemnity plans, two established and competing preferred provider organizations, and a Blue Cross/Blue Shield plan.

In 1984, the State evaluated the availability of physician services in each county. Three classes of availability were determined, by specialty. Key results of the survey for the counties that would most likely be the

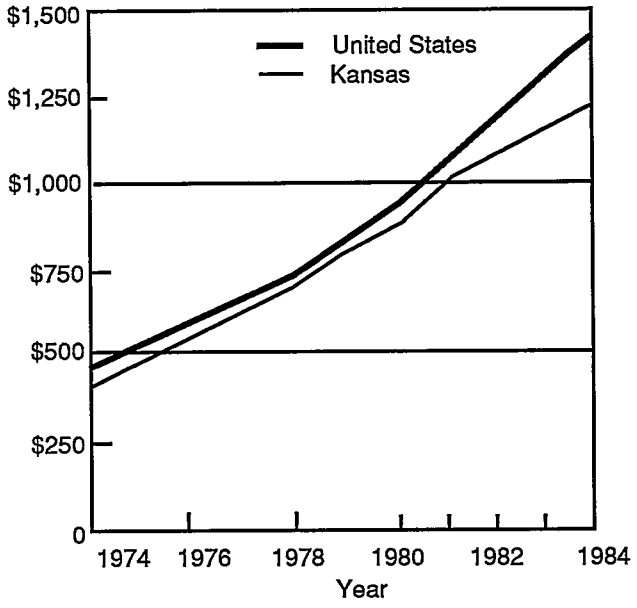


FIGURE 4.6—PER CAPITA EXPENDITURES FOR PERSONAL HEALTH CARE IN THE UNITED STATES AND KANSAS, 1974-1984.

ANNUAL PERCENTAGE RATE OF INCREASE

Year	United States	Kansas
1975	13.5	14.5
1976	13.4	13.1
1977	12.0	13.2
1978	9.2	11.3
1979	12.2	12.6
1980	14.6	13.8
1981	15.1	11.0
1982	11.6	8.9
1983	10.0	8.0
1984	8.1	7.0

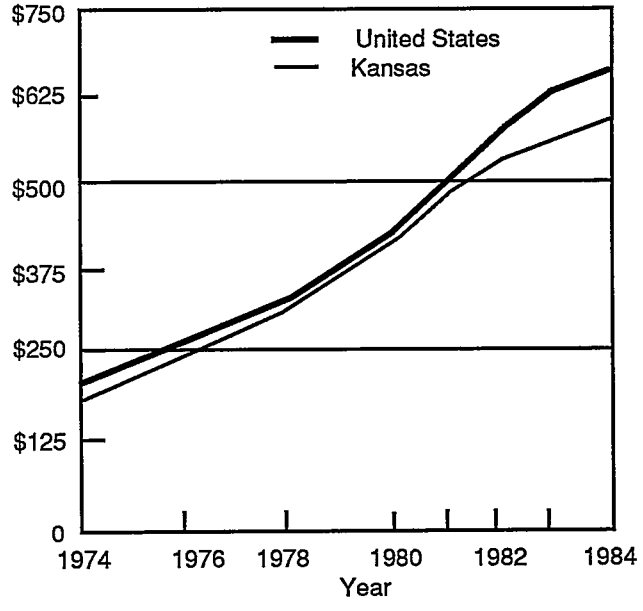


FIGURE 4.7—PER CAPITA EXPENDITURES FOR HOSPITAL CARE IN THE UNITED STATES AND KANSAS, 1974-1984.

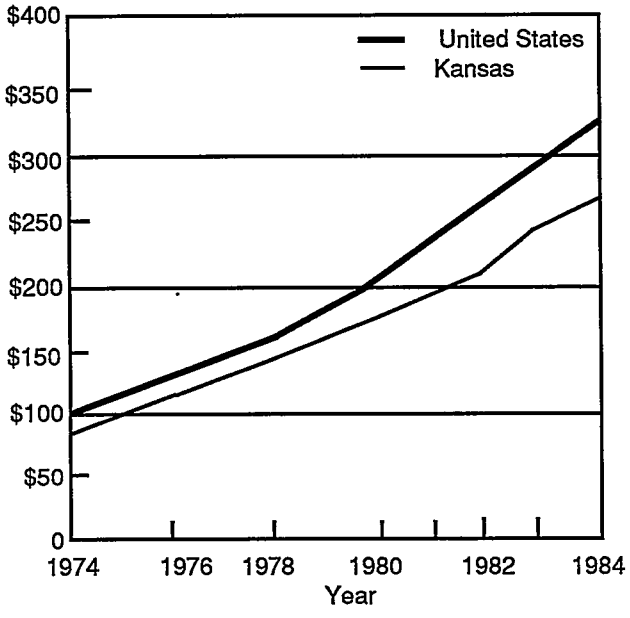


FIGURE 4.8—PER CAPITA EXPENDITURES FOR PHYSICIANS'SERVICES IN THE UNITED STATES AND KANSAS, 1974-1984.

site of medical services utilized by staff and visitors to the project appear in Table 4.13 (Source: "Medically Underserved Areas-1984," Kansas Department of Health and Environment, December 31, 1984).

In addition, the area has an emergency-preparedness response plan in place. The State of Kansas has implemented a Nuclear Facilities Incident Response Plan, which is coordinated between the University of Kansas Medical Center (65 miles from the SSC site), the Kansas Division of Emergency Preparedness (15 miles from the SSC site), and the Kansas Department of Health and Environment (8 miles from the SSC site). The purpose of this response plan is to provide prompt medical attention to those State, county, and local government personnel or members of the general public who may require medical attention for injury or illness resulting from an accident or incident at the Wolf Creek Generating Station (a nuclear power plant 30 miles south of the SSC site). Treatment will be provided for those whose condition has resulted from exposure to radiation or who may be contaminated with radioactive materials.

In summary, staff and family members of the SSC project will have several competing options available for health coverage, ranging from conventional medical indemnity to preferred provider organizations. They will have immediate access to a well-developed health-care system ranging from primary care and emergency services to the most sophisticated tertiary facilities. These services are available at a moderate cost when compared to the U.S. as a whole. Just as important, visiting scientists will have access to a range of services capable of dealing with virtually any medical problem or emergency situation.

Table 4.13—AVAILABILITY OF PHYSICIAN SERVICES IN THE FOUR-COUNTY AREA.

AS: Adequately Served U: Underserved CU: Critically Underserved

Primary Care	
Osage County	CU[a]
Shawnee County	AS
Douglas County	AS
Johnson County	AS
General Surgery	
Osage County	AS
Shawnee County	AS
Douglas County	AS
Johnson County	AS
Orthopedic Surgery	
Osage County	AS
Shawnee County	AS
Douglas County	AS
Johnson County	AS
Urology	
Osage County	AS
Shawnee County	AS
Douglas County	AS
Johnson County	AS
Opthamology	
Osage County	AS
Shawnee County	AS
Douglas County	AS
Johnson County	AS
Obstetrics and Gynecology	
Osage County	AS
Shawnee County	AS
Douglas County	AS
Johnson County	AS
Otorhinolaryngology	
Osage County	AS
Shawnee County	AS
Douglas County	AS
Johnson County	AS
Psychiatry	
Osage County	AS
Shawnee County	AS
Douglas County	AS
Johnson County	AS
Dermatology	
Osage County	AS
Shawnee County	AS
Douglas County	AS
Johnson County	AS

(continued from previous column)

Radiology	
Osage County	AS
Shawnee County	AS
Douglas County	AS
Johnson County	AS
Anethesiology	
Osage County	AS
Shawnee County	AS
Douglas County	AS
Johnson County	AS
Pathology	
Osage County	AS
Shawnee County	AS
Douglas County	AS
Johnson County	AS
Internal Medicine Subspecialties	
Osage County	AS
Shawnee County	AS
Douglas County	AS
Johnson County	AS
Surgical Specialties	
Osage County	AS
Shawnee County	AS
Douglas County	AS
Johnson County	AS
Physical Medicine	
Osage County	U
Shawnee County	U
Douglas County	U
Johnson County	U
Neurology	
Osage County	AS
Shawnee County	AS
Douglas County	AS
Johnson County	AS

[a]The rural nature of Osage County explains the shortage of primary care physicians. All of the counties adjacent to Osage that have larger urban centers, i.e. Shawnee, Douglas, Franklin, and Lyon, have adequate primary physician services. Significant growth in the population of Osage County would likely precipitate the establishment of primary care practices, although they are now available with a 15 to 30 minute drive from virtually anywhere in the county.

4.7.2 Recreation Resources

Northeast Kansas offers access to professional and intercollegiate spectator sports. Kansas City is home to the NFL's Chiefs, the American League's Royals, and the Major Indoor Soccer League's Comets. Two Big Eight Conference schools, the University of Kansas (Lawrence) and Kansas State University (Manhattan), display some of the best talent in college sports.

Numerous outdoor and spectator recreation opportunities exist within the SSC vicinity. Over 5,200 camping and picnic sites and 413 miles of scenic trails are available near the proposed site. Approximately 1,700 camp sites have been developed at State parks and lakes in the area. Over 99,000 acres of lakes and reservoirs lie within proximity of the site. Pomona Lake, with a full complement of boating, sailing, and camping facilities, lies in the center of the proposed SSC ring. Within a half-hour drive from the proposed SSC campus are Melvern Lake to the southwest and Clinton Lake to the northeast, which also offer fine sailing and water-skiing opportunities. Area lakes provide over 500,000 square feet of safe swimming areas.

Nearby lakes and rivers offer excellent sport fishing. The area also offers fine opportunities for hunting upland birds, water fowl, game mammals, and big game. Over 130,000 acres are available for public hunting.

Both Topeka and Kansas City maintain well kept city parks which date back to the early 1900's. Each city has a growing zoo program. The Kansas City Zoo has a fine collection of animals, with many native-habitat exhibits. The Topeka Zoo features an innovative ape exhibit and an exotic tropical rain forest. Other recreational opportunities in the area include golf, hot-air ballooning, polo, and organized cycling and running events.

4.8 EDUCATIONAL AND CULTURAL RESOURCES

4.8.1 Elementary and Secondary Education

Kansas has a history of strong support for public education and a record of high achievement by the graduates of its public schools. The state ranks well above U.S. averages in all nationally comparable measures of education investment and student achievement. Seventy percent of Kansas' 1985 high-school graduates continued their educations upon graduation.

Data presented in Table 4.14 are derived from the February 1987 report on state education statistics published by the Office of Planning, Budget, and Analysis of the U.S. Department of Education and reflect Kansas' standing in selected measures for the 1985-86 school year.

Recent additional investments in maintaining and improving the strength of elementary and secondary education statewide include increasing the average expenditure per pupil for the 1986-87 school year to $3914, a 9.9% increase over 1985-86; increasing the State government's share of education costs from 42% in 1983 to 45% in 1986; instituting teacher-certification testing and performance-based teacher incentives; and enhancing the capacity of schools to provide instruction to handicapped students.

Elementary and secondary education in the four-county area in which most SSC staff would be likely to live is typical of the statewide system (Table 4.15). Education expenditures are generally at the same level across the state and resultant measures of achievement are equivalent.

Kansas has maintained a strong commitment to the educational needs of exceptional children since 1949, when a special-education division was created within the State Department of Education. All school districts are required to provide specialized programs to their gifted and learning-handicapped children. In the 1985-86 school year, Kansas spent $67 million of State funds and $11 million in Federal funds to address the needs of 41,000 handicapped and 11,000 gifted students.

The Special Education Department at the University of Kansas conducts a nationally recognized program of teaching, training, research, and curriculum development in special education. The department operates a laboratory for infants and pre-school children with learning disabilities which is available to area residents and offers guidance, counseling, and referrals.

State-licensed day care is available throughout the four-county area. Kansas was a pioneering state in regulation and licensure of child-care facilities. In addition to requiring annual inspection and licensure for all categories of day-care facilities, Kansas is currently the only state to require annual licensure of all organizations that perform day-care referrals. Table 4.16 provides information of State-licensed day-care facilities statewide and in the four-county area.

Private elementary and secondary education is widely available through the 159 accredited secular and church-sponsored institutions across the state.

4.8.2 Higher Education and Research Institutions

Higher education and research are plentiful and diverse in northeast Kansas and the Kansas City metropolitan area. Private and public institutions in the region provide the academic and technical disciplines that can

TABLE 4.14—SELECTED STATEWIDE EDUCATION MEASURES.

Category	Kansas	National
Dollars per Pupil	$3560	$3449
Expenditures as percent of per capita income	25.8	24.9
Pupil/Teacher Ratio	15.4	17.9
Graduation Rate	81.4%	70.6%
1986 ACT Average Score	19.2	18.8
1986 SAT Average Score		
Verbal	498	431
Math	544	475

TABLE 4.15—SELECTED EDUCATION STATISTICS FOR THE FOUR-COUNTY AREA.

		Selected Education Statistics for Four-county Area					
County	Unified School Districts	Enrollment	High Schools	Junior High Schools	Middle Schools	Elem. Schools	Pupil/ Teacher Ratio
DOUGLAS	Baldwin	927	1			4	14.3
	Eudora	805	1			1	18.3
	Lawrence	7,803	1		3	17	19.5
TOTAL		9,535	3		3	22	
FRANKLIN	West Franklin	753	2			3	14.1
	Central Heights	507	1		1	1	12.9
	Wellsville	668	1			1	14.4
	Ottawa	2,259	1		1	5	17.2
TOTAL		4,187	5		2	10	
OSAGE	Osage City	662	1			1	15.5
	Lyndon	366	1			1	14.0
	Santa Fe Trail	1,230	1		1	3	15.2
	Burlingame	360	1			2	10.8
	Marais des Cygne	319	1		1	2	12.1
TOTAL		2,937	5		2	9	
SHAWNEE	Seaman	3,552	1		2	8	18.5
	Silver Lake	603	1			1	12.8
	Auburn/ Washburn	3,177	1	1	2	3	19.9
	Shawnee Heights	3,340	1	1		4	19.0
	Topeka	14,813	3		5	26	18.8
TOTAL		25,425	7	2	9	42	

Table 4.15 (continued)

County	Districts	Post High School Education[a] Academic Preparation	Post High School Education[a] Other	Expense per Pupil Operating Budget	Expense per Pupil All School Expenditures	Exceptional Education Handicapped	Exceptional Education Gifted
DOUGLAS	Baldwin	64.8	0	$3,417	$3,571		
	Eudora	51.7	0	3,052	3,326		
	Lawrence	67.2	8.2	2,931	3,276		
TOTAL						865	632
FRANKLIN	West Franklin	26.7	20	3,570	3,683		
	Central Heights	41.3	17.4	3,987	4,251		
	Wellsville	50	0	3,769	3,979		
	Ottawa	50.4	3	2,850	2,941		
TOTAL						442	95
OSAGE	Osage City	39.1	13	3,294	3,532		
	Lyndon	66.7	0	3,909	4,281		
	Santa Fe Trail	39	4.9	3,276	3,471		
	Burlingame	35.3	5.9	3,922	4.153		
	Marais de Cygne	57.1	0	4,144	4,343		
TOTAL						310	62
SHAWNEE	Seaman	57.7	9.6	2,928	3,242		
	Silver Lake	68.6	7.8	3,847	4,109		
	Auburn/ Washburn	62.2	8	2,700	3,136		
	Shawnee Heights	60.6	0	2,969	3,312		
	Topeka	50.1	4	3,474	3,594		
TOTAL						2,609	802

[a]Post high school academic programs included enrollment in 4-year college, 2-year college and community college. Other includes: Enrollment is AVTS, Private Technical or professional institution, licensed by the state of Kansas.
Source: Kansas Department of Education, Division of Financial Services. All data for 1986-87 school year except post high school data which reflect 1985-86 school year .

TABLE 4.16—STATE-REGULATED CHILD-CARE FACILITIES (statewide).

Type of Facility	Number of Facilities	Est. Number of Children
Child Care Centers	514	20,000 (Avg. 40 per center)
Preschools	399	12,000 (Avg. 30 full-time equivalent children)
Licensed Day Care Homes	2,081	20,000 (Max 10 children)
Group Day Care Homes	147	1,800 (Max. 12 children)
Registered Day Care Homes	3,464	21,000 (Max. 12 children)
TOTAL 6,605	74,800	

Table 4.16 (continued)

State-regulated Child-Care Facilities (four-county area)					
Type of Facility	Average Number of Children per Unit in all Counties	Douglas	Franklin	Osage	Shawnee
Child Care Centers	40	15	3	1	50
Preschools	20	6	4	5	15
Licensed Day Care Homes	10	34	15	38	410
Group Day Care Homes	12	17	1	2	7
Registered Day Care Homes	6	133	30	36	64
TOTAL		205	53	82	546

benefit the staff and operations of the SSC. These institutions participate in the social and economic activities of the region and contribute regularly to decision-making processes of private business and government. Within the region, three universities offer doctoral degree programs of study: Kansas State University (Manhattan), the University of Kansas (Lawrence), and the University of Missouri-Kansas City. Area institutions that offer master's degree programs are Emporia State University (Emporia), Washburn University (Topeka), and Baker University (Baldwin City). Sixteen nearby four-year colleges and universities offer baccalaureate degrees. Also located near the site are 11 two-year and community colleges and six Area Vocational-Technical Schools (see Section 4.4.2). A nationally recognized, not-for-profit, contract research institution, the Midwest Research Institute is in Kansas City, Kansas.

The University of Kansas (KU), Kansas State University (KSU), and Emporia State University (ESU) are part of the Kansas Board of Regents system. KU and KSU are the principal research institutions of Kansas. In Federal fiscal-year 1985, total Federal funding for research was $37.2 million at KSU and $26.7 million at KU. Total research expenditures for State fiscal-year 1986 were $40.4 million at KSU and $38.4 million at KU.

The main campus of the University of Kansas is located in Lawrence, 36 miles from the SSC campus. On the main campus are the schools of Architecture and Urban Design, Business, Continuing Education, Liberal Arts and Science, Education, Engineering, Journalism and Mass Communications, Fine Arts, Law, and Pharmacy. The schools of Allied Health, Medicine, and Nursing are located at the University of Kansas Medical Center (KUMC) in Kansas City, Kansas. Total enrollment on the Lawrence campus is about 20,000 undergraduates and 6,000 graduate students. An additional 2,600 students are enrolled at KUMC. In addition to traditional campus offerings, KU offers courses by correspondence and evening courses at several locations in northeast Kansas.

KU libraries have a collection of over 2.5 million books and subscribe to approximately 29,000 periodicals. The Hall Center for the Humanities houses the university's internationally recognized humanities programs. KU supports four notable area-studies programs with a variety of study-abroad opportunities and instruction in more than 25 languages. The William Allen White School of Journalism is rated as one of the top five journalism schools in the country. The KU School of Engineering and Bureau of Child Research are also noted for their quality.

The Kansas Geological Survey and the Kansas Biological Survey are research divisions at KU. These organizations maintain substantial data bases on the natural resources of the state and regularly offer their expertise to business, industry, and government.

KU operates a Digital Equipment Corporation (DEC) VAX 8650 and an IBM 3031-AP computer for academic use. The system can accommodate simultaneously 192 time-sharing users and is operated 24-hours a day. Both computers are housed in a new building with a full line of user-support services.

Research at KU's Department of Physics and Astronomy is focused on the following topics: astronomy, condensed-matter physics, geophysics, high-energy physics, nuclear physics, computational physics, and space and plasma physics (Table 4.17). Departmental experimental and research facilities include a magnetic-resonance spectrometer, facilities for crystal growth and thermal treatment of samples, cryogenic equipment including a dilution refrigerator and SQUID device, and

TABLE 4.17—EXTERNAL FUNDING FOR RESEARCH IN THE DEPARTMENT OF PHYSICS AND ASTRONOMY AT THE UNIVERSITY OF KANSAS, JULY 1986-JUNE 1987.

Research Area	No. of Grants	Total Funding
Applied Physics	1	$46,000
Astrophysics	5	27,000
Atmosphere and Space Physics, Cosmic Rays	11	246,000
Elementary Particles and Fields	3	208,000
Nuclear Physics	1	73,000
Physics Education	3	53,000
TOTAL	24	$653,000

TABLE 4.18—EXTERNAL FUNDING FOR RESEARCH IN THE DEPARTMENT OF PHYSICS AT KANSAS STATE UNIVERSITY, JULY 1986-JUNE 1987.

Research Specialty	No. of Grants	Total Funding
Applied Physics	4	$127,800
Atomic and Molecular Physics	4	2,868,000
Biophysics	1	118,000
Physics Education	1	110,000
Solid State	7	417,000
TOTAL	17	$3,640,800

instrumentation for dielectric and diffusion measurements. Computation and data analysis can be done with the two VAX 11/750 systems within the department, which are linked to departmental laboratories, and the University computing center The department has access to the NSF funded CRAY system in Princeton, New Jersey.

KSU, a one-hour drive from the proposed campus, offers graduate and undergraduate programs in its eight colleges: Arts and Sciences, Engineering, Business Administration, Agriculture, Education, Human Ecology, Architecture and Design, and Veterinary Medicine. Total enrollment is 13,000 undergraduate and 2,300 graduate students.

In the tradition of the land-grant universities, Kansas State University continues to take knowledge and opportunity to the people. In addition to operating a statewide network of county agricultural and home-economics extension offices, KSU recently received approval from the Board of Regents to request funding for the installation of a center for educational telecommunications in Kansas. The new technology will make the resources of Regents universities available throughout the state. Short courses, professional updating, language and science programs for small rural school districts, and cooperative Regents offerings are a few of the many possibilities.

The Department of Physics at KSU offers study in applied physics, educational physics, experimental atomic physics, experimental biophysics, experimental condensed-matter physics, and theoretical physics. Among these, one focus is clearly on research in atomic physics (Table 4.18). The James R. Macdonald Laboratory, which opened in 1969, is the only university accelerator in the nation dedicated solely to the study of atomic-collision physics.

The facilities currently available for experimental research in atomic physics consist of the tandem Van de Graaff accelerator, a 3-million-volt positive ion accelerator, and a 100-kilovolt electrostatic accelerator. To operate the facility, the department received an operating grant from the DOE of $1 million this year and anticipates a slightly larger grant next year. In addition, the lab has received a $5.1 million grant from the Department of Energy and an additional $1.09 million in matching funds from the Kansas Legislature to finance the addition of a Superconducting Linac for which the present 6-mV Van de Graaff accelerator will be the injector. A cryogenic Electron Beam Ion source will also be added, as well as new control and data-acquisition computers. The physics department is also developing and installing a CRYEBIS (cryogenic electron-bombardment ion source).

In addition to the usual beam-focusing and vacuum apparatus of ion accelerators, the laboratory is well equipped with magnetic and electrostatic devices for selection of well-defined initial atomic states and several movable vacuum stations for preparation of differentially pumped gas targets peculiar to atomic-physics experiments. For data acquisition and analysis, the department employs four DEC VAX computers.

For research in condensed-matter physics, KSU has state-of-the-art laser laboratories equipped with argon ion, Nd:YAG, excimer, and dye lasers, and Raman, Fabry, Perot, and correlation spectrometers. Other facilities include a conventional X-ray laboratory, an electron-diffraction and microscope laboratory, a UV spectrometer, three on-line PDP computers, a thin-film laboratory, a 20-k0e electromagnet, a superconducting magnet, a SQUID device, and facilities for storing and handling liquid helium. The KSU Physics Department has a DEC VAX 11/750 computer system in addition to access to the University computer, a National Advanced System NAS/6130. During the academic year of 1986-87, the Department of Physics obtained $3,640,800 in support for departmental research, of which $3,513,800 was Federal funding and $127,000 was from State and local sources (Table 4.18).

Emporia State University (ESU) is a regional institution with schools of Education, Library and Information Management, Business, and Liberal Arts and Sciences. The primary thrust of the institution is its education and library and information management programs. Undergraduate education is emphasized with a limited number of master's degree programs, some extending through the education specialist degree. The institution's research activity is directed toward the enhancement of its teaching mission and the dissemination of information on current research, particularly as it relates to effective schools. Enrollment at ESU is approximately 4,100 undergraduate and 1,300 graduate. The ESU campus is located 44 miles southwest of the proposed SSC campus.

Current tuitions at KU, KSU, and ESU are listed on Table 4.19. The tuition at both KU and KSU is $36.00 per credit hour for a resident undergraduate. The national average for state universities and land-grant colleges is $42.50 per credit hour. Tuition at ESU is about $4.40 less per credit hour than the national average of comparable schools. The 1987 Kansas Legislature also authorized the Board of Regents to allow persons coming into the state to accept full-time employment in Kansas to pay resident-rate tuition even if they have not lived in Kansas long enough to qualify for resident status. Incoming SSC personnel would benefit from this provision.

Other institutions of higher education exist in the region which are not part of the Kansas Regents system. Washburn University is located in Topeka, 16 miles north of the site. Washburn University is organized under five schools: Law, Business, Arts and Science, Nursing, and Applied and Continuing Education. The Juris Doctor degree is offered by the Law School and master's degrees are given in education, psychological clinical skills, and business administration. Associate degrees in vocational skills are offered through the School of Applied and Continuing Education. Enrollment totals about 6,600 with 5,900 undergraduates and 480 law students. Although Washburn University is a private institution, it receives a substantial amount of State aid and tuition is relatively low (Table 4.19).

Baker University is located 25 miles east of the proposed SSC site in Baldwin City, Kansas. It is a four-year liberal arts college affiliated with the Methodist church. Baccalaureate degrees are offered in Arts, Science, and Music and a Masters of Liberal Arts degree is offered to continuing-education students. In the fall of 1987, Baker will inaugurate a new program in international business that will lead to B.A. and M.A. degrees. Enrollment is about 780 full-time undergraduates and 140 part-time graduate students. Tuition is typical for a private institution (Table 4.19).

The University of Missouri-Kansas City (UMKC) is a major campus of the University of Missouri system. UMKC has schools of Arts and Science, Business and Public Administration, Dentistry, Medicine, Law, Pharmacy, Nursing, Education, Engineering, and Music. Special programs include coordinated undergraduate engineering, computer science, and telecommunications. Enrollment is about 7,000 undergraduates and 4,400 graduate students. Tuition at UMKC is slightly higher than the national average for State-supported universities (Table 4.19).

The Linda Hall Library of Science and Technology is adjacent the campus of the University of Missouri-Kansas City. The library maintains over 600,000 volumes, 33,000 conference proceedings, and in excess of 200,000 research monographs and reports. Some 17,000 current journal titles in 40 languages are received and catalogued annually. The library serves as a document repository for numerous Federal agencies including the U.S. Patent Office and the Department of Energy.

Also located in Kansas City is the Midwest Research Institute (MRI), a not-for-profit contract research organization. The Institute employs 450 people and handles approximately $90 million annually in contracts with private industry and government. The Department of Energy is one of MRI's largest clients with a recently renewed $50 million contract to manage the Solar Energy Research Institute (SERI) in Golden, Colorado. The institute provides expertise in analytical chemistry, engineering, and material science; economic research and management science; and environmental and health research.

TABLE 4.19—TUITION COSTS AT UNIVERSITIES IN NORTHEAST KANSAS AND KANSAS CITY, MISSOURI.

Institution	Location	Undergraduate		Graduate	
		Resident	Non-resident	Resident	Non-resident
University of Kansas	Lawrence, KS	36.00	108.00	40.00	112.00
Kansas State University	Manhattan, KS	36.00	108.00	40.00	112.00
Emporia State University	Emporia, KS	30.50	80.00	33.75	83.50
Washburn University	Topeka, KS	65.00	93.00	68.00 108.00[a]	96.00 140.00[a]
Baker University	Baldwin, KS	153.33	153.33	153.33	153.33
University of Missouri	Kansas City, MO	49.60[b] 59.90[c]	148.80[b] 164.60[c]	66.50	180.40

[a]Law-school tuition
[b]Freshmen and sophomores
[c]Juniors and seniors

4.8.3 Cultural Resources

The proposed site's proximity to metropolitan Kansas City and Kansas' two major universities places it within easy reach of a wide array of cultural opportunities.

Kansas City is home to world-class fine-arts collections and museums including the Nelson Gallery of Art and its associated Atkins Museum of Fine Arts and E.F. Pierson Sculpture Garden; The Kansas City Art Institute and its Kemper Gallery; and numerous commercial galleries centered in the city's historic Westport district. The Nelson gallery's Oriental collection is world-renowned.

The city itself is an urban gallery with an abundence of fountains and statuary. The Country Club Plaza district, developed in the 1920's by J. C. Nichols, was graced with over $1 million worth of fountains and statuary and has been a focal point for the works of European and American sculptors ever since.

The performing arts are equally energetic and include the Kansas City Philharmonic which performs at the City Music Hall, The Kansas City Ballet at home at the Lyric Theatre, and the Missouri Repertory Theatre's first-class company. The Midland Center for the Performing Arts offers two houses for concerts and performances by national touring companies and the Folly Theatre, recently restored by the Kansas City Performing Arts Foundation, offers performances ranging from jazz and silent films to chamber ensembles.

Educational museums in Kansas City are numerous and include the Kansas City Museum of History and Science and its planetarium, and the Truman Museum and Library.

Metropolitan Kansas City's diverse cultural opportunities are all within a 1 1/2-hour drive from the site and less than an hour from Lawrence, Kansas, where many SSC staff will likely choose to live.

Lawrence is home to the University of Kansas, which sponsors a variety of performing-arts events each year through its concert and chamber music series. Lawrence is also home to the Dyche Museum of Natural History and the Spencer Museum of Art. The latter's 25,000-piece collection specializes in European artists of the Baroque and Renaissance periods. Lawrence also has an active local theatre group and an arts center offering numerous programs for both children and adults.

The performing arts are also available in Topeka and Manhattan through the performing-artists series of

Kansas State University and Washburn University. Local theatre groups are active in both communities.

In summary, the Kansas site is rural but not remote. Its proximity to the Kansas City metropolitan area puts it in close touch with a full range of high-quality cultural opportunities, all readily accessible by interstate highway from the residential communities in which staff are likely to live.

4.9 COMMUNITY SUPPORT

4.9.1 Existing and Potential Community Support

Following the decision to submit a proposal for the SSC, Kansas officials undertook a series of informational meetings with community leaders and citizens throughout the area likely to be affected by the project.

State legislators, county and city commissioners, and local township officials were thoroughly briefed by the Governor, the Secretary of the Kansas Department of Commerce, and SSC project managers. Subsequently, public meetings sponsored by State legislators representing the area were held in four locations over the course of seven weeks.

These meetings were widely publicized, attended by over 1,000 citizens, and covered by regional television news stations. Public discussion was spirited and included statements of support from area legislators. Public statements of support dramatically outweighed indications of reservations or opposition.

In addition, Kansas SSC project staff met with county commisions at regularly scheduled public board meetings to provide additional information and respond to questions. Subsequently, local governments throughout the project area adopted resolutions of support for the project (volume 4, appendix 6). Local elected officials report widespread support among their constituents. These local units are small, nonbureaucratic, and generally supportive of growth and development not incompatible with their predominantly agricultural economic bases.

In sum, local support is strong and can be expected to continue so.

4.9.2 Existing and Anticipated Opposition

Opposition has been voiced by a small number of individuals whose property is included in acreage which will be conveyed to DOE. Such opposition is neither widespread nor organized and is off-set by support from other affected property owners who are either unconcerned or enthusiastic.

In addition, some statewide environmental groups have expressed concern related to the generation, handling, and disposal of low-level radioactive waste. Sensitivity to this issue has been keen in recent months because of contemporaneous, though unrelated, concern that Kansas will be selected as the host state for the Central Interstate Low Level Radioactive Waste Compact Commission site.

DOE's commitment to accept responsibility for SSC-generated low-level waste and to provide for disposal at existing DOE facilities in the absence of an invitation by the SSC host state to utilize locally available facilities has muted further expression of concern.

In summary, no significant opposition now exists and none is expected to emerge. Kansas State government officials are prepared to address squarely any opposition which might emerge in the future.

4.10 NON-FEDERAL GOVERNMENT SUPPORT

4.10.1 Description of State, Regional, and Local Government Support

The small size of Kansas State government, the uncomplicated, straightforward land-use regulatory schemes of affected local governments, and the enthusiastic support throughout the region all point to a positive environment for cooperation and problem resolution.

The State of Kansas has gained the support of Governor John Ashcroft and the State of Missouri for its application, and regional and statewide business groups, including the Kansas Chamber of Commerce and Industry and the Kansas City Chamber of Commerce have endorsed the proposal.

During its 1987 regular session, the Kansas Legislature adopted legislation conveying special authority the the Secretary of the Kansas Department of Commerce to exercise the State's eminent domain authority on behalf of the SSC, appropriating in advance such sums as will be necessary to purchase required land, and enabling the Kansas Corporation Commission to adopt special orders regarding the provision of electric and telecommunications utility service to the facility (volume 4, appendix 7).

This legislation, conveying a wide range of special powers and authorities to State agencies is unprecedented in Kansas history and reflects the extent of political commitment to the project. The Kansas Corporation Commission has already exercised its authority under the special legislation to adopt an advanced certification of service to the SSC and to approve a rate schedule for electric utilities (Section 8.1 and volume 8, appendix 1).

To help Osage County mitigate short-term adverse impacts and to optimize developmental advan-

tages associated with the SSC, the State of Kansas has established a team including representatives of the Kansas Department of Commerce, the Cooperative Extension Service, and private planning consultants to support the efforts of the County Commission. The team will begin work with the County in September 1987, in order to build a base of local capacity to work with the State and the DOE should the Kansas site be included on the DOE Best Qualified List.

By Executive Order 87-98 (volume 4, appendix 8), Governor Hayden established the Kansas SSC Project Office to serve as a single focal point for all aspects of the project. The office and its functions are detailed in Section 4.10.4. In general, the office will operate with the full authority of the Governor in providing assistance to the DOE in such areas as manpower and labor relations, permit acquisition and regulatory assistance, private-sector liaison, community and family services, and public and community relations.

4.10.2 Existing State and Local Laws, Regulations, and Practices

A review of existing laws, regulations, policies, codes, plans, ordinances, rights, and other statutes and jurisdictions that might be invoked by the SSC or that could affect the SSC at the proposed site has been conducted. A detailed listing of Kansas permit and regulatory requirements, their implementing agencies, and key contacts is presented below.

Final selection of the Kansas site was made in part because while it offered sound geology and ready access to transportation and urban amenities, it nonetheless avoids significantly urbanized or developed communities. Insofar as Federal authority will override local development regulations for Federally owned lands, the only impact of these regulations will be upon ancillary development.

In general, local planning, zoning, building code, and health and safety regulation in the affected areas is minimal. Essentially agricultural in nature, the three counties in which the collider would be located have adopted plans and land-use regulatory schemes aimed primarily at protecting agricultural uses from incompatible development.

Osage County adopted a preliminary comprehensive plan in 1983 and subsequently adopted implementing land-use and development regulations in 1986. The county has not adopted building or sanitation codes but utilizes provisions of Kansas' statewide sanitation code in limited application.

Douglas County adopted county-wide zoning and sub-division regulations in 1966 and maintains an updated comprehensive plan. The county issues building permits but has not adopted building or sanitation codes.

Franklin County has adopted a comprehensive plan but has not adopted zoning or other development-related regulations.

No land which would be conveyed to the DOE lies within the boundaries of incorporated municipalities, thus the only impact associated with such regulations will be upon ancillary development within these municipalities. Generally, municipal zoning in the area is minimally restrictive and supportive of economic development. Key provisions of Kansas regulatory structure and related permits are briefly described below. Information is organized on the basis of the issuing Kansas State agency.

Further specific information will be required from the DOE in order to determine which, if any, of these permits and processes will be relevant to SSC construction and operations.

The Kansas SSC Office, described in Section 4.10.4, will provide centralized assistance to DOE and its contractors in determining and securing such permits as are ultimately required.

KANSAS BOARD OF AGRICULTURE:

A) Water Appropriation Permit

Overview: All non-domestic water users must obtain the written approval of the State Chief Engineer before placing water to beneficial use. Filing for water rights establishes the user's priority for that water. Three different types of permits, temporary, term, and regular, may be obtained. The type of permit issued is based on quantity of water used and time span of water rights. A series of term permits will be issued for the initial SSC construction activity requiring water use. The Board of Agriculture does not foresee any obstacle in issuing these permits for the construction and operation of the SSC facility.

Statutes:	K.S.A. a-701 et seq.
Processing Time:	45 days
Contact Person:	Warren Lutz or Wayland Anderson Division of Water Resources (913) 296-2684

B) Activity Affecting Natural Streams

Overview: An application and plan of proposed construction affecting the course, current, or cross section of a natural stream must be approved by the State Chief Engineer. This statute is not likely to be invoked by the SSC construction or operation.

Statutes:	K.S.A. 82a-301 to 305a
Contact Person:	Warren Lutz

Division of Water Resources
(913) 296-2684

C) Water Transfer Permit (10 miles or more)

Overview: A panel of the Chief Engineer, the Director of the Kansas Water Office, and the Director of the Kansas Department of Health and Environment must hold a public hearing regarding the diversion of water for distances greater than 10 miles. A transfer permit will be required under the current proposal for the City of Topeka to supply SSC water. If Topeka sells water to the SSC project, the City of Topeka must obtain the transfer permit. The State of Kansas and the City of Topeka are involved in extensive work regarding the details of this arrangement.

Statutes:	K.S.A. 82a-1501
Processing Time:	The hearing must be held a maximum of 60 days after the application is complete. A maximum of 90 days later the permit must be either granted or denied.
Contact Person:	Warren Lutz Division of Water Resources (913) 296-2684

D) Water Conservation Plan Review

Overview: The Chief Engineer may require an applicant for a Water Appropriation Permit to adopt and implement conservation plans and practices consistent with Water Office guidelines.

Statutes:	K.S.A. 82a-711(d)
Contact Person:	Warren Lutz Division of Water Resource (913) 296-2684

KANSAS CORPORATION COMMISSION

A) Selection of Electric Supplier to SSC Facility

Overview: The Corporation Commission has the authority to determine which utility will supply electricity to the SSC site. The electric-power supplier has already been determined by the Commission. If needed the Kansas Corporation Commission can also use its authority to determine the supplier of telecommunications equipment.

Statute:	1987 Session Laws of Kansas, Chapter 327
Processing Time:	Already complete
Contact Person:	Eva Powers Kansas Corporation Commission (913) 296-2543

B) Siting of Electric Transmission Lines

Overview: New transmission lines require a siting permit from the Kansas Corporation Commission. The SSC site proposal involves a new transmission line.

Statute:	K.S.A. 66-1,177 through 1,183
Processing Time:	60 to 120 days
Contact Person:	Eva Powers Kansas Corporation Commission (913) 296-2543

C) Contractual Rates for Electric Service

Overview: Contracts on electric service rates or tariff rates must be filed with the Kansas Corporation Commission. The Commission will determine the reasonableness of the proposed rates.

Statutes:	K.S.A. 66-101c
Processing Time:	45 Days
Contact Person:	Eva Powers Kansas Corporation Commission (913) 296-2543

KANSAS DEPARTMENT OF HEALTH AND ENVIRONMENT

A) Kansas Department of Health and Environment Permitting of Disposal Wells

Overview: Brackish water which seeps into the SSC tunnel during construction must be disposed of. Brackish water, waters used to clean filtration systems, and radioactive waters may be disposed of by injection into underground formations. The Kansas Department of Health and Environment requires a permit for the construction and operation of these disposal wells.

Statutes:	K.S.A. 65-171d and 65-164
Processing Time:	Maximum of 45 days. The Kansas Department of Health and Environment does not anticipate that this permit will be required.
Regulations:	Article 46
Contact person:	Don Carlson Bureau of Water Protection (913) 862-9360 ext. 220

B) Solid Waste Disposal at Kansas Department of Health and Environment Permitted Facility

Overview: Solid wastes generated by the SSC that will not be disposed of at a Federal disposal site must be disposed of at a Kansas Department of Health and Environment permitted facility.

Statutes:	K.S.A. 65-3401 through 3423
Regulations:	K.A.R. 28-29-1 through 27
Contact person:	Joe Cronin Bureau of Water Management (913) 862-9360 ext. 501

C) Regulation of Disposal of Hazardous Wastes

Overview: The Kansas Department of Health and Environment regulates all facilities within the state that generate more than 55 pounds of hazardous wastes per month. The SSC must meet the Kansas Department of Health and Environment standards regarding the disposal of hazardous wastes.

Statutes:	K.S.A. 65-3430, et seq.
Regulations:	K.A.R. 28-31-1 through 13
Contact person:	John Mitchell Bureau of Waste Management (913) 862-9360 ext. 499

D) Permits for Emissions Greater than State Regulatory Limits

Overview: Prior to construction, the Kansas Department of Health and Environment must approve new sources of air contaminants with emissions exceeding State limitations. Asphalt and concrete plants must be permitted by the Kansas Department of Health and Environment. Pollution created by construction must be controlled. Emission standards that will be applied are generally the same as Federal emission standards. Permits will most likely be required for construction of the SSC.

Statutes:	K.S. A. 65-3001 through 3023
Regulations:	K.A.R. 28-19-8 through 159
Processing time:	Less than 1 month
Contact person:	Gene Sallee Bureau of Air Quality and Radiation Control (913) 862-9360 ext. 267

E) Radiation Control

Overview: The Kansas Department of Health and Environment has no permitting or licensing authority over Federal facilities. When the site reverts to State ownership after decommissioning, the State may be responsible for any inherited radioactivity problems.

Statutes:	K.S.A. 48-1601
Regulations:	K.A.R. 28-35-40 and K.A.R. 28-35-11a through 234a
Contact person:	Mary Thompson or Gerald Allen Bureau of Air Quality and Radiation Control (913) 862-9360 ext. 288

F) Surface Water Quality Standards

Overview: Surface-water-quality standards and procedures are defined by the Kansas Department of Health and Environment. The proposed site design will not affect local surface-water quality. The Kansas Department of Health and Environment may ask for simple erosion-control measures during SSC construction.

Statutes:	K.S.A. 65-171d
Regulations:	K.A.R. 28-16-28b through 28f
Contact Person:	Don Snethen Bureau of Water Protection (913) 862-9360 ext. 255

G) Reservoir Sanitation Zones

Overview: The Kansas Department of Health and Environment regulates and controls development of areas surrounding certain water impoundments in order to prevent pollution and to maintain healthful and sanitary conditions. Given the Kansas SSC site character and location, it will not be difficult to meet these Kansas Department of Health and Environment standards.

Statutes:	K.S.A. 65-184 through 189f
Regulations:	K.A.R. 28-10-26 (Pomona Reservoir) and K.A.R 28-10-75 through 108
Contact Person:	Karl Mueldener Bureau of Water Protection (913) 862-9360 ext. 218

H) Public Water Supply Systems

Overview: Operators of public water-supply systems must obtain a permit from the Kansas Department of Health and Environment. If the City of Topeka maintains control over water supply, the SSC facility itself will not need this permit.

Statutes:	K.S.A. 65-163, 163a and 170d
Regulations:	K.A.R. 28-15-1 through 37
Processing time:	Two weeks to 30 days
Contact Person:	Karl Mueldener Bureau of Water Protection (913) 862-9360 ext. 218

I) Plugging Abandoned Wells

Overview: Wells and test holes shall be plugged and sealed in accordance with the Kansas Department of Health and Environment standards and guidelines. The SSC project may need to use a licensed contractor for this purpose.

Statutes:	K.A.A. 82a-1213
Regulations:	K.A.R. 28-30-1 through 10
Contact Person:	Darrel Plummer Bureau of Water Protection (913) 862-9360 ext. 221

J) Water and Wastewater Treatment Plant Operator Certification

Overview: Water- and wastewater-treatment plants must be operated under the supervision of an operator certified by the Kansas Department of Health and Environment. Treatment-plant operators will be allowed training time to become certified.

Statutes:	K.S.A. 65-4501 through 4517
Regulations:	K.A.R. 28-16-29
Contact Person:	Jim Current Bureau of Water Protection (913) 862-9360 ext. 21000

KANSAS DEPARTMENT OF HUMAN RESOURCES

A) Employment/Unemployment

Overview: The Federal government is not required to file with the State when hiring in Kansas. The State does not regulate labor standards for Federal employment. If an unemployment claim is filed with Kansas from a person formerly employed by the Federal government, however, the Federal government will be billed for the appropriate amount of unemployment compensation.

Contact:	Paul B. Bicknell Chief of Contributions (913) 296-5025

KANSAS STATE HISTORICAL SOCIETY

A) Historic Preservation

Overview: The Kansas SSC location meets all State preservation laws. The State preservation officer must be notified of actions taken to comply with the National Historic Preservation Act. Site research shows that a small amount of documentation will be necessary to satisfy Federal preservation standards.

Contact:	Joseph Snell State Historic Preservation Officer (913) 296-3289

KANSAS DEPARTMENT OF TRANSPORTATION

A) Permit to Operate Oversized or Overweight Equipment on State Highways

Overview: Oversized or overweight vehicles must obtain Department of Transportation permits to use State highways.

Statute:	K.S.A. 8-1742 and K.S.A 8-1911
Regulation:	K.A.R. 35-1-1 through 36-1-27
Processing time:	Several days
Contact Person:	F. J. Reid Chief of Traffic Engineering (913) 296-3618

B) Permits for Use of Highway Rights-of-Way

Overview: Construction of public and private utilities across, under, or over any State highway right-of-way must comply with State regulations and be authorized by a Department of Transportation permit. This permit applies to the relocation and the removal of fixtures.

Statutes:	K.S.A. 68-404 and 68-415
Regulations:	K.A.R. 36-11-6
Processing time:	Several days
Contact Person:	William Armstrong Construction and Maintenance (913) 296-3576

C) Standard Building Specifications

Overview: All bridges, culverts, and railroad crossings must be built in conformance with the Department of Transportation's specifications. These specifications are generally the same as Federal standards.

Statutes: K.S.A. 68-1108
Contact Person: Deb Miller
Planning and Development
(913) 296-2252

D) Elimination of Grade Crossings

Overview: The Secretary ofTransportation may determine apportionment of costs of grade-crossing eliminations. Given the proposed site plan, this statute will probably not be invoked by the SSC project.

Statutes: K.S.A. 68-509
Contact Person: Deb Miller
Planning and Development
(913) 296-2252

E) Approval of Plans by County Engineer or State Engineer

Overview: The Kansas Department of Transportation examines and approves or orders modifications in all highway bridges and culverts plans that exceed $200,000 for repair or construction.

Statute: K.S.A. 68-1111
Contact Person: Deb Miller
Planning and Development
(913) 296-2252

General laws or requirements of other agencies which affect the Kansas Department of Transportation operations and may affect the SSC project are listed below.

F) Relocation Assistance

Overview: Agencies and political sub-divisions must comply with the Federal Uniform Assistance and Real Properties Acquisition Policies Act of 1970.

Statute: K.S.A. 58-3501
Contact: John Strahan
(913) 296-3831

G) Wildlife Permits

Overview: The SSC project must show compliance with the Kansas Non-Game and Endangered Species Act.

Statutes: K.S.A. 32-501-510
Processing time: 30 days
Contact: A. H. Stallard
Environmental Services
(913) 296-3531

KANSAS SECRETARY OF STATE

A) Authority to do Business in Kansas

Overview: All incorporated businesses operating in Kansas must register with the Kansas Secretary of State. This will affect all contractors of the SSC project.

Statutes: K.S.A. 17-6001 et seq.
Contact: John R. Wine, Jr.
Assistant Secretary of State
(913) 296-2236

KANSAS STATE FIRE MARSHALL DEPARTMENT

A) Storage and/or Dispensing of Flammable Liquids

Overview: Plans for buildings and lands used for the storage and/or dispensing of flammable liquids must be submitted to the Kansas State Fire Marshall Department for approval. Standards are the same as nationally defined codes.

Statutes: K.S.A. 31-133
Contact: Paul Markley
State Fire Marshall's Office
(913) 296-3401

KANSAS DEPARTMENT OF REVENUE

A) Taxes

Overview: The U.S. Government is exempt from all income, sales and property taxes. Contractors and subcontractors are exempt from sales and use taxes on purchases of goods and services required for the construction of the SSC. Application must be made by the contractors and subcontractors for a sales-tax exemption certificate for the SSC project. Out-of-state contractors will need to file with the Department of Revenue in order to do business in the state. Contractors, subcontractors, and individual employees of the U.S. Government are subject to various state and local taxes on their income.

Contact: John Parks
Planning and Research
(913) 296-3081

4.10.3 State, Regional, and Local Tax Laws

Three major tax categories, income, sales, and property, will impact the SSC facility and individuals associated with it during construction and operation. In general their effect is as follows:

The U.S. Government would be exempt from all income, sales, and property taxes.

Contractors and subcontractors of the Federal government would generally be exempt from sales and use taxes on purchases of goods and services for the project. Corporate contractors and subcontractors would be subject to property taxes on their personal property under current law. Contractors and subcontractors would also be subject to State income taxes on their Kansas source of income.

Individual employees of the U.S. government or contractors would be subject to the various State and local taxes on their personal income, purchases, and real or personal property.

An explanation of particular taxes and features thereof follows.

INCOME TAXES

INDIVIDUAL - Individuals working on the project, either during or after construction, and whether employed by the U.S. Government or by contractors/ subcontractors, would be taxed on their Kansas source income at individual income-tax rates. The overall average effective rate for tax-year 1985 was 2.0 percent of gross income or 3.8 percent of taxable income. Shareholders of Subchapter S corporations are subject to individual income tax, since their businesses are not subject to the Kansas corporate income tax. There are no local city or county earnings or income taxes in Kansas.

CORPORATE - The income of corporations working at the project would be subject to the Kansas corporate income tax, both during and after construction. Kansas requires combined reporting for unitary corporations. It uses the standard three-factor apportionment formula contained in the Uniform Division of Income for Tax Purposes Act (UDITPA) for determining corporate income taxable in Kansas. The Kansas income base is Federal taxable income with minor modifications. The normal corporate-tax rate is 4 1/2 percent with a surtax of 2 1/4 percent on taxable income above $25,000. Kansas also has many corporate incentives for supporting businesses which locate or expand in Kansas such as Business and Job Development Credit, which would reduce their corporate-tax liability. If the project were to be declared an Enterprise Zone, the tax credits would be $350 per $100,000 invested. Any new or expanded business within an enterprise zone, qualifying for the Business and Job Development credit, would also be exempt from sales taxes on their purchases of personal property or services used in the construction of their new or enlarged facility. Any sales taxes paid on machinery or equipment used in manufacturing or processing or to expand production capacity will be refunded, provided the purchase totaled $50,000 or more and resulted in at least two new full-time production employees for each $50,000 expended.

SALES (AND USE) TAXES

The State sales and use tax rate is 4 percent. Individual cities and counties are permitted by local option to levy a local sales tax of either 0.5 percent or 1.0 percent. Of the counties in the proposed site, Franklin and Osage counties have a 1 percent county sales tax and Douglas has none.

Cities within these counties with local sales tax levies are: Douglas County—Baldwin, Eudora, and Lawrence, all at 0.5 percent and Franklin County—Ottawa, Pomona, and Williamsburg, all at 0.5 percent. Osage County presently has no cities with a city sales tax.

INDIVIDUALS - Individuals working on the project during construction or at the project following construction would be subject to State and local sales or use taxes on their purchases of items for personal use, even if later reimbursed by the U.S. Government.

CONTRACTORS - Upon request by the U.S. Government, a project exemption certificate would be issued for the SSC Project. The U.S. could then provide its contractors and their subcontractors with a copy of the exemption certificate which would make their purchases of materials and services for this project exempt from State and local sales and/or use taxes. Purchases of machinery and equipment to which the contractor retains ownership and which would be removed from the site following completion of the project would be subject to sales or use taxes. Motor fuels for off-road use on the project would be tax exempt, but motor fuel purchased by the contractor for highway use would be taxed: gasoline at 11 cents per gallon and diesel at 13 cents per gallon.

PROPERTY TAXES

Real property and personal property of individuals and corporations located in Kansas is subject to ad valorem property taxes. The property-tax policies of Kansas are presently undergoing a major restructuring. Statewide reappraisal is well underway and is scheduled for completion before January 1, 1989. On January 1, 1989, a new schedule for the classification of property will become effective. The new assessment ratios to be used in conjunction with the new appraisal values are intended to

make the new property-tax program essentially revenue neutral among classes of property.

The following shows the average 1986 property-tax rates expressed as a percent of market value:

County	Tax Rate as % of Market Value
Douglas	1.54%
Franklin	1.52%
Osage	1.30%
Statewide	1.40%

INDIVIDUALS - Individuals would be subject to property tax on their residences and other real property located in Kansas and on limited categories of personal property such as motor vehicles, boats, and airplanes registered in Kansas.

CONTRACTORS - Although contractors, subcontractors, and other businesses would be working on land ceded to the U.S. Government, under present statutes, the personal property of corporations would be taxed with the following exceptions:

Effective January 1, 1989, merchants' and manufacturers' inventories will be exempt from ad valorem taxation.

Commercial and industrial machinery and equipment, effective January 1, 1989, would be valued at 20% of retail cost new, less 7 years of straight-line depreciation to a floor of 20% of retail cost when new.

The property of unincorporated contractors on the site would not be taxed.

4.10.4 State, Regional, and Local Permit and Procedural Support

Kansas has established by Executive Order of the Governor (volume 4, appendix 8), a Superconducting Super Collider coordinating committee and project office.

Under the provisions of the Executive Order, the coordinating committee will be composed of individuals representing the State agencies, universities, and private firms which participated in preparation of the project proposal. DOE and its contractors will thus have available throughout the project the skills, experience, and continuity of those who have been associated with the enterprise since its inception.

The SSC Project Office will serve as a single point of contact with State and local governments and will be staffed and supported by individuals with demonstrated skills and experience in programs and issue areas likely to emerge during construction. Established within the office of the Secretary of the Kansas Department of Commerce, the project office will have full authority to call upon and coordinate the resources of the State government and to act as ombudsman with local governments on behalf of the project.

It will be the single point within Kansas State government responsible for insuring the implementation of all requirements and commitments detailed within the state's proposal, including real property acquisition and conveyance, highway construction and local road improvements, construction of water-supply pipeline facilities, and execution of final agreements between the DOE and the State regarding spoils disposal.

On an on-going basis, the office will address such functions as:

Manpower and Labor Relations including employment and specialized training services, labor-management relations, labor ombudsman/ arbitration services, and EEO/ affirmative-action support to the project.

Permit Acquisition and Regulatory Assistance including single-point permitting information and assistance for State permits and coordination and liaison with local government regulatory, planning, permitting, and zoning agencies.

Private Sector Liaison including assistance to the DOE and its contractors in identifying suppliers of goods and services, as well as liaison with utilities, financial institutions, and other private-sector resources.

Community and Family Services including coordination and special assistance as needed in such areas as housing, medical, transportation, social, day care, and children's services.

Public and community relations on behalf of the DOE and its contractors.

Kansas State government is prepared to consult with DOE's on-site management team to insure that the SSC Project Office has the capacity to meet the project's needs. The vigorous commitment of the Governor and State Legislature to the project guarantee DOE's ability to rely upon the office as an effective single point through which expected and unforeseen issues can be resolved.

The small size of Kansas State government and the relatively uncomplicated zoning and land-use regulatory structures of affected local governments lend themselves to easy problem resolution. Moreover, the enthusiastic support of the local government units in the area of the facility points to minimal regulatory difficulties.

Volume 4

Appendix 1—Letters from Secretary of Transportation to counties in site vicinity concerning transportation improvements

STATE OF KANSAS

KANSAS DEPARTMENT OF TRANSPORTATION
Docking State Office Building
Topeka 66612-1568
(913) 296-3566

Horace B. Edwards
Secretary of Transportation

Mike Hayden
Governor of Kansas

June 23, 1987

Ms. Dorothy Shoup
Chairwoman, Osage County Commission
Osage County Courthouse
Lyndon, Kansas 66451

Dear Commissioner Shoup:

In discussions with the SSC Project Management Team, it was mentioned that a clarification of the State's position vis-a-vis the impact of the siting of the Super Collider on Osage County roads and bridges would be helpful.

In the event that the State of Kansas is designated the official site of the U.S. Department of Energy's Superconducting Super Collider, the construction and operation of the facility will require the improvement of certain roads and bridges in Osage County. The attached map identifies their locations. The State of Kansas, through the Secretary of Transportation, will provide for the upgrading of these roads and bridges at the State's expense.

The initial proposal calls for improvement of five bridges and eighty miles of roads. This proposal should not be construed as a definitive description of the improvements that may be necessary, as the Department of Energy has full discretion to make any changes it deems desirable upon final siting. However, the proposal reflects the input and best judgment of the SSC Site Design team, representatives of the Department of Transportation, and representatives of Osage County. It is clear that any road improvements that must be made to directly serve the Super Collider will be the responsibility of the State of Kansas. The Department of Transportation will work with Osage County officials to coordinate this work with ongoing maintenance and improvement plans of the County.

I hope that this clears up any questions regarding the impact of the Super Collider on Osage County's transportation infrastructure.

Sincerely,

Horace Edwards

HORACE B. EDWARDS
Secretary of Transportation

Attachment
cc: Mr. Terry Smith, SSC Project Manager

STATE OF KANSAS

KANSAS DEPARTMENT OF TRANSPORTATION
Docking State Office Building
Topeka 66612-1568
(913) 296-3566

Horace B. Edwards
Secretary of Transportation

Mike Hayden
Governor of Kansas

July 6, 1987

Mr. Charles Mavity
Chairman, Franklin County Commission
Franklin County Courthouse
Ottawa, Kansas 66067

Dear Commissioner Mavity:

In future discussions with the SSC Project Management Team, it will undoubtedly be mentioned that a clarification of the State's position vis-a-vis the impact of the siting of the Super Collider on Franklin County roads would be helpful.

In the event that the State of Kansas is designated the official site of the U.S. Department of Energy's Superconducting Super Collider, the construction and operation of the facility will require the improvement of certain roads and bridges in Franklin County. The attached map identifies their locations. The State of Kansas, through the Secretary of Transportation, will provide for the upgrading of these roads and bridges at the State's expense.

The initial proposal calls for improvement of one bridge and 14.3 miles of roads. This proposal should not be construed as a definitive description of the improvements that may be necessary, as the Department of Energy has full discretion to make any changes it deems desirable upon final siting. However, the proposal reflects the input and best judgment of the SSC Site Design team, representatives of the Department of Transportation, and representatives of Franklin County. It is clear that any road improvements that must be made to directly serve the Super Collider will be the responsibility of the State of Kansas. The Department of Transportation will work with Franklin County officials to coordinate this work with ongoing maintenance and improvement plans of the County.

I hope that this clears up any questions regarding the impact of the Super Collider on Franklin County's transportation infrastructure.

Sincerely,

Horace Edwards

HORACE B. EDWARDS
Secretary of Transportation

Attachment
cc: Mr. Terry Smith, SSC Project Manager

STATE OF KANSAS

KANSAS DEPARTMENT OF TRANSPORTATION
Docking State Office Building
Topeka 66612-1568
(913) 296-3566

Horace B. Edwards
Secretary of Transportation

Mike Hayden
Governor of Kansas

July 6, 1987

Mr. David Hopper
Chairman, Douglas County Commission
Douglas County Courthouse
Lawrence, Kansas 66044

Dear Commissioner Hopper:

In an initial discussion with members of your staff and the SSC Project Management Team, it was mentioned that a clarification of the State's position vis-a-vis the impact of the siting of the Super Collider on Douglas County roads would be helpful.

In the event that the State of Kansas is designated the official site of the U.S. Department of Energy's Superconducting Super Collider, the construction and operation of the facility will require the improvement of certain roads in Douglas County. The attached map identifies their locations. The State of Kansas, through the Secretary of Transportation, will provide for the upgrading of these roads and bridges at the State's expense.

The initial proposal calls for improvement of eight and one-half miles of roads. This proposal should not be construed as a definitive description of the improvements that may be necessary, as the Department of Energy has full discretion to make any changes it deems desirable upon final siting. However, the proposal reflects the input and best judgment of the SSC Site Design team, representatives of the Department of Transportation, and representatives of Douglas County. It is clear that any road improvements that must be made to directly serve the Super Collider will be the responsibility of the State of Kansas. The Department of Transportation will work with Douglas County officials to coordinate this work with ongoing maintenance and improvement plans of the County.

I hope that this clears up any questions regarding the impact of the Super Collider on Douglas County's transportation infrastructure.

Sincerely,

Horace Edwards

HORACE B. EDWARDS
Secretary of Transportation

Attachment
cc: Mr. Terry Smith, SSC Project Manager

Volume 4

Appendix 2—High-technology companies in the region

High-Technology Companies in the SSC Region

Advanced Equipment Manufacturers

Allied Bendix Aerospace
2000 Bannister
Kansas City, Mo. 64131

Alpha Industries
11730 W. 86th Terr.
Shawnee Mission, Kan. 66214

Amdahl Corporation
8717 W. 110th, No. 450
Shawnee Mission, Kan. 66210

Anderson, Inc.
320 W. 8th St.
Kansas City, Mo. 64114

Anixter Brothers
9746 Pflumm Road
Lenexa, Kan. 66215

Bendix-Kansas City Div.
2000 E. 95th St.
Kansas City, Mo. 64131

Camtek
13205 W. 75th Terr.
Lenexa, Kan. 66216

Chloride Industrial Batteries
3001 Fairfax Trafwy.
Kansas City, Kan. 66115

Cirtech Corporation
15237 Cherry
Shawnee Mission, Kan. 66223

Colt Technology Corporation
15301 W. 109th
Lenexa, Kan. 66219

Control Systems International, Inc.
8826 Santa Fe Drive
Overland Park, Kan. 66212

Custom Industrial Controls
1022 Lindenwood
Liberty, Mo. 64068

Demex, Inc.
5833 Outlook
Shawnee Mission, Kan. 66202

Dit-Mco International Corp.
5612 Brighton Terr.
Kansas City, Mo. 64130

Electronic Research Company
7618 Wedd
Overland Park, Kan. 66204

Electronic Controls
5603 Merriam Lane
Merriam, Kan. 66203

Fike Technical Services
704 S. 10th
Blue Springs, Mo. 64015

General Instrument Corporation
9101 W. 110th
Shawnee Mission, Kan. 66210

Growth Industries
12523 3rd
Grandview, Mo. 64030

H.E.S. International, Inc.
1815 Merriam Lane
Kansas City, Kan. 66106

Hi-Line Plastics
801 E. 56 Highway
Olathe, Kan. 66061

Hisonic, Inc.
249 N. Troost Ave.
Olathe, Kan. 66061

Hybrids International Ltd.
311 N. Lindenwood Drive
Olathe, Kan. 66062

Innovative Software
9875 Widmer
Lenexa, Kan. 66215

Interconnect Devices, Inc.
5101 Richland Ave.
Kansas City, Kan. 66106

International Dynamics
6901 Mission Road
Shawnee Mission, Kan. 66208

K & E Mfg.
301 N. Central
Lee's Summit, Mo. 66202

Kansas City Scientific
4747 Troost
Kansas City, Mo. 64110

Kansas City Southern Lines
114 W. 11th St.
Kansas City, Mo. 64105

Keitel Inc.
10805 Hickman Mills Drive
Kansas City, Mo. 64137

King Radio
400 N. Rogers Road
Olathe, Kan. 66062

Kohlman Systems Research, Inc.
319 Perry St.
Lawrence, Kan. 66044

Kustom Electronics
8320 Nieman Road
Lenexa, Kan. 66214-1510

LPF Plastics
812 Woodswether Road
Kansas City, Mo. 64105

Midwestern Electronic
9016 W. 51st. Terr.
Shawnee Mission, Kan. 66203

Milbank Mfg. Co.
4801 Dermus
Kansas City, Mo. 64120

MKC Electronics
9205 Quivira Road
Overland Park, Kan. 66215

New Age Electronics
9633 Metcalf
Shawnee Mission, Kan. 66212

Northrop Wilcox
2001 NE 46th St.
Kansas City, Mo. 64116

Nova-Tech Inc.
4820 College Blvd.
Overland Park, Kan. 66211

Oscillatek, Div. K&L Microwave
620 N. Lindenwood
Olathe, Kan. 66062

Perkin-Elmer Corp.
8400 W. 110th No. 130
Shawnee Mission, Kan. 66212

Power-Tech Mfg., Inc.
9900 Pflumm, Unit 46
Lenexa, Kan. 66215

Regal Plastic Supply
111 E. 10th Ave.
No. Kansas City, Mo. 64116

Russell Co. Labs
2463 Harrison
Kansas City, Mo. 64108

Rycom Instruments
9351 E. 59th St.
Kansas City, Mo. 64133

Semco
4301 Swartz Road
Kansas City, Kan. 66106

Sentinel Enclosures, Inc.
2221 Metropolitan
Kansas City, Kan. 66105

Sunrise Systems
2800 Rockcreek Parkway
No. Kansas City, Mo. 64117

Torotel Inc.
13402 S. 71 Hwy.
Grandview, Mo. 64030

Van-Ton Machine Specialities
205 W. Dennis Ave.
Olathe, Kan. 66061

Vista Manufacturing Co.
1307 Central
Kansas City, Kan. 66102

Wilcox Electric Inc.
2001 NE 46th
Kansas City, Mo. 64116

Wright Systems
4500 Troost
Kansas City, Mo. 64110

Xerox Artificial Intelligence Systems
7501 College Blvd.
Overland Park, Kan. 66210

Advanced Equipment Distributors

A.W. Schultz Co.
8101 W. 63rd St
Shawnee Mission, Kan. 66202

Applied Resources, Inc.
9910 Widner
Lenexa, Kan. 66215

AT&T Technology Systems
77 N. Blue Parkway
Lee's Summit, Mo. 64063

Bannon Educational Systems Inc.
5750 W. 95th St.
Shawnee Mission, Kan. 66207

Butler National Corporation
8246 Nieman Road
Lenexa, Kan. 66214

Carlton Copmany
438 E. 95th St.
Kansas City, Mo. 64131

Computer Dataco, Inc.
2020 Charlotte
Kansas City, Mo. 64108

Contell Inc.
10904 E. 97th Terr.
Kansas City, Mo. 64134

Continental Disk Corp
4103 N.W. Riverside Road
Kansas City, Mo. 64150

DCI Inc.
14812 W. 117th St.
Olathe, Kan. 66062

Digital Enterprises
11331 E. 23rd St.
Independence, Mo. 64052

Digital Simplistics Inc.
3879 W. 95thSt.
Overland Park, Kan. 66206

Display Data Corp.
10880 Benson No. 2300
Overland Park, Kan. 66210

Durkin Equipment Co.
8605 Quivira Road
P.O. Box 14382
Lenexa, Kan. 66215

Electro Dynamics
9075 Cody
Overland Park, Kan. 66214

Electronics Supply
4100 Main
Kansas City, Mo. 64111

Integrated Support
8855 Long
Lenexa, Kan. 66215

Mid Tec Assoc.
11900 W. 87th St. Pkwy., Suite 220
Lenexa, Kan. 66215

Midwest Electrical, Inc.
939 W. 8th St.
Kansas City, Mo. 64101-1205

New Age Electronics
9633 Metcalf
Overland Park, Kan.66212

Phoenix Aerospace
220 W. 80th Terr.
Kansas City, Mo. 64114

Plus Dynamics, Inc.
P.O. Box 6753
Leawood, Kan. 66206

Andrew Zahner Co.
3906 Central
Kansas City, Mo. 64111

Tempmaster
1222 Ozark
No. Kansas City, Mo. 64116

Electronics Consumer Concepts
P.O. Box 6141
Shawnee Mission, Kan. 66206

Wattmaster
1222 Ozark
Kansas City, Mo. 64116

Computer Related Services

Accu-Comp Computer Service
11816 Armitage Drive
Kansas City, Mo. 64134

ACMS, Inc.
4747 Troost
Kansas City, Mo. 64110

Adcomp Data Systems, Inc.
14440 E. 42nd
Independence, Mo. 64055

American Computer Sources, Inc.
1509 W. 40 Highway
Blue Springs, Mo. 64015

ASCI Corporation
10820 W. 64th St.
Shawnee Mission, Kan. 66203

A/S/K Associates
1505 Kasold Drive
Lawrence, Kan. 66044

Automated Systems Consultants
10820 W. 64th St.
Overland Park, Kan. 66212

Automated Systems Management
7199 W. 98th Terr.
Overland Park, Kan. 66212

Bremson Data Systems, Inc.
11691 W. 85th St.
Lenexa, Kan. 66214

Business Information Systems
8705 E. 63rd. St., No. 200
Kansas City, Mo. 64133

Business Problem Solvers
250 Richard Road, Suite 254
Kansas City, Mo. 64116

Canton Automated Systems, Ks
8264 Nieman Road
Shawnee Mission, Kan. 66215

Capital Data Systems, Inc.
14500 W. 105th St.
Lenexa, Kan. 66215

Carrier Systems
1605 Baltimore Ave.
Kansas City, Mo. 64108

Ceka Management Assoc.
710 Main
Blue Springs, Mo. 64015

Cerner Corporation
2800 Rockcreek Pkwy.
Kansas City, Mo. 64117

Communications Network
131 Kindred St.
Bonner Springs, Kan. 66012

Compucounts Inc.
8540 Blue Ridge Blvd., No. 11690
Kansas City, Mo. 64138

Compusoft Plus
7650 N. Oak Trafficway
Gladstone, Mo. 64118

Computacations of Kansas City, Inc.
10300 W. 103rd St. No. 305
Overland Park, Kan. 66212

Computer ASP
7115 N.W. Barry Road
Kansas City, Mo. 64152

Computer Data Corp.
4210 Johnson Drive
Shawnee Mission, Kan. 66205

Computer Learning Source
6701 W. 91st St.
Overland Park, Kan. 66212

Computer Mailing
3006 Holmes
Kansas City, Mo. 64109

Computer Programming Services Inc.
4200 Somerset Drive No. 230
Prairie Village, Kan. 66208

Computer Sciences Corp.
726 Minnesota Ave.
Kansas City, Kan. 66101

Computer Smart
9605 W. 87th
Overland Park, Kan. 66212

Computerwise, Inc.
302 N. Winchester
Olathe, Kan. 66062

Continental Healthcare Systems, Inc.
7300 W. 110th
Overland Park, Kan. 66210

Contral Data Business Center
2911 Main
Kansas City, Mo. 64108

Control Data Corporation
6900 Squibb Road 120
Shawnee Mission, Kan. 66202

Constructive Computing
5600 Inland Drive
Kansas City, Kan. 66106

Creative Data Systems
55 Corporate Woods, Suite 150
9300 W. 110th St.
Overland Park, Kan. 66210

Creative Programs Unlimited, Inc.
Open Systems Accounting
Software Support
9816 E. 87th St., Suite D
Kansas City, Mo. 64138

Crescendo Systems, Inc.
6600 College Blvd., Suite 220
Overland Park, Kan. 66211

Crystal Computers Inc.
11555 W. 83rd Terr.
Lenexa, Kan. 66214

Custom Transcribing Service
1900 W. 47th Place No. 205
Shawnee Mission, Kan. 66205

LDS Inc.
10550 Marty 101
Overland Park, Kan. 66212

D S T Systems
127 W. 10th St., No. 820
Kansas City, Mo. 64105

Data Anilas, Ltd.
3220 Mesa Way, Suite A
Lawrence, Kan. 66044

Data Output, Inc.
18713 E. 30th Terr.
Independence, Mo. 64055

Data Flow
430 NW 58th
Kansas City, Mo. 64118

Data Processing Consultants, Inc.
4528 Belleview, Suite 222
Kansas City, Mo. 64111

Data Retrieval Services, Inc.
6301 Winchester Drive, No. 203
Kansas City, Mo. 64133

Data Scan
10880 Lowell, Suite 300
Overland Park, Kan. 66210

Data Scribe
3838 Rainbow
Kansas City, Kan. 66103

Data Team Corp.
4121 W. 83rd. St.
Shawnee Mission, Kan. 66208

Datacomp
1808 Harvard
Independence, Mo. 64052

Dataphase Corp.
9000 W. 67th St.
Shawnee Mission, Kan. 66202

Datasmith
P.O. Box 8036
Shawnee Mission, Kan. 66208

Datasystem Designers Inc.
4350 Johnson Drive, No. 179
Shawnee Mission, Kan. 66205

Datatran Key Punch Service
9801 Belleview
Kansas City, Mo. 64114

Dealers Automation
P.O. Box 744
Kansas City, Mo. 64141

Dolginoff Management Associates, Inc.
11050 Roe Avenue, Suite 200
Overland Park, Kan. 66211-1217

EDS
5750 West 95th St.
Shawnee Mission, Kan. 66205

Electronic Computer Programming
611 W. 39th St.
Kansas City, Mo. 64111

Evolution
5809 Reeds Rd., Suite 100
Mission, Kan. 66202

FLAE Enterprises
11004 E. Highway 40
Independence, Mo. 64055

Forsythe & Associates
8500 W. 63rd St., No. 111
Shawnee Mission, Kan. 66202

General Data Processing
5242 Horton
Shawnee Mission, Kan. 66202

Richard H. Gumpertz Ph.D.
Computer Problem Solving
8905 Mohawk Lane
Leawood, Kan. 66206

HLE Systems, Inc.
P.O. Box 4714
Overland Park, Kan. 66204-0714

Hatt Data Systems
2528 S. Highway 291
Independence, Mo. 64057

Info Data Services, Inc.
817 Wyandotte
Kansas City, Mo. 64105

Information Control Inc.
6700 Corporate Dr. No. 236
Kansas City, Mo. 64120

Intelligent Software
3170 Mercier, Suite 102
Kansas City, Mo. 64111-3632

Inland Associates, Inc.
9290 Bond, Suite 104
Overland Park, Kan. 66214

Interactive Information
2519 Madison Ave.
Kansas City, Mo. 64108

J & M Industries
6803 W. 64th St.
Shawnee Mission, Kan. 66202

Kansas City Data
1900 Erie, Suite 307
Kansas City, Mo. 64116-3435

Kansas City Digital System Corp.
1503 Westport Road
Kansas City, Mo. 64111

KC Data Centre Inc.
2131 Washington Ave.
Kansas City, Mo. 64108

Krohm International Ltd.
3535 Broadway, Suite 412
Kansas City, Mo. 64111

Kustom Electronics
8320 Nieman Road
Lenexa, Kan. 66214

Langenbacher Data Systems
12400 Olive Blvd., Suite 350
St. Louis, Mo. 63141

LDS Inc.
10550 Marty, Suite 102
Overland Park, Kan. 66212

Lee Information Systems Inc.
4801 W. 110th St., Suite 180
Overland Park, Kan. 66211

Lewis & Associates
3812 Beechwood Drive
Lee's Summit, Mo. 64063

Liberty Data Services, Inc.
14 E. Franklin
Liberty, Mo. 64068

Longs Data Entry
10007B E. 66th Terrace
Raytown, Mo. 64133

LSI Data Services
9058 Parkhill
Lenexa, Kan. 66215

Luman Consultants
P.O. Box 2566
Shawnee Mission, Kan. 66201

MacKenzie and Company, Inc.
P.O. Box 1118
Lawrence, Kan. 66044

Management Concepts
450 Minnesota Ave.
Kansas City, Kan. 66101

Manatron Inc.
1575 Universal Ave., Suite 126
Kansas City, Mo. 64120

Manion Technologies, Inc.
4000 Baltimore
Kansas City, Mo. 64111

Marion Computing Systems, Inc.
13021 W. 102nd Terrace
Shawnee Mission, Kan. 66215

McDonnell Douglas
8700 Indian Creek Parkway No. 120
Shawnee Mission, Kan. 66210

Medical Communication Systems
12401 E. 43rd St.
Independence, Mo. 64055

Meri-I-Tec Systems
P.O. Box 7754
Overland Park, Kan. 66207

Micro I
4650 College Blvd. No. 203
Overland Park, Kan. 66211

Mid-Continent Data Processing
1617 Baltimore
Kansas City, Mo. 64108

Midwest Data Processing Inc.
1801 Main
Kansas City, Mo. 64108

Midwestern Data Inc.
1637 Iron
Kansas City, Mo. 64116

Mirale Computing
313 Clayton Court
Lawrence, Kan. 66044

Multi-User Solutions
11721 W. 62nd Terr.
Shawnee, Kan. 66203

NBRC Management Service
11015 W. 75th Terr.
Shawnee Mission, Kan. 66214

OAO Corp.
4550 W. 109th St., No. 207
Overland Park, Kan. 66211

Optimation Inc.
645 North Powell
Independence, Mo. 64050

Overfelt Data Processing
1125 Grand Ave., Suite 701
Kansas City, Mo. 64106

Panther Technology, Inc.
7301 Mission Road, Suite 140
Prairie Village, Kan.

PDA Inc.
11800 College Blvd., No. 100
Overland Park, Kan. 66210

Planning Analysis Corporation
8500 W. 100th St., Suite 210
Overland Park, Kan. 66210

Professional Resources Centers
4701 College Blvd., Suite 106
SW Corner Roe & College
Leawood, Kan. 66211

Professional Solutions Inc.
8023 Wayne Ave.
Kansas City, Mo. 64131

Program Systems Inc.
3822 Summit
Kansas City, Mo. 64111

Quantitative Business Systems
1617 Main, Suite 200
Kansas City, Mo. 64108

Real Share, Inc.
8650 W. College Blvd. No. 113
Overland Park, Kan. 66210

R H Enterprises Inc.
1730 Main
Kansas City, Mo. 64108

Rolcer Computing Inc.
4420 N.E. Chouteau Trwfy.
Kansas City, Mo. 64117

Ruf Corp.
1533 E. Spruce
Olathe, Kan. 66061

S.P. Roufa & Co.
P.O. Box 7266
Overland Park, Kan. 66211

Schaffer Computing Services, Inc.
1828 Swift, Suite 202
Kansas City, Mo. 64116

Sega, Inc.
15238 Cherry
Stanley, Kan. 66223

Select Systems
6001 W. 101st St.
Overland Park, Kan. 66207

Shaw Killer Software
6001 NW Valley Road
Kansas City, Mo. 64151

Silicon Prairie Software
4200 Somerset
Overland Park, Kan.

Computer Task Group Inc./
Specialty Systems Management
11020 King St., Suite 370
Overland Park, Kan. 66210

SMS
4220 Johnson Drive. No. 315B
Shawnee Mission, Kan. 66205

Software AG
8900 Indian Creek Pkwy. No. 260
Overland Park, Kan. 66210

Software Center International
3732 W. 95th St.
Leawood, Kan. 66206

Steve Stefanini
303 S. Forrest Ave.
Liberty, Mo. 64068

Stromberg Datagraphix
10920 Ambassador Dr. No. 502
Kansas City, Mo. 64153

Superior Systems Technology
1027 W. Blue Pkwy.
Lee's Summit, Mo. 64063

System One Software, Inc.
4420 Madison, Suite 270
Kansas City, Mo. 64111

Systems Communications
1515 W. Truman Road
Independence, Mo. 60450

Systems Designs Management Information
1900 W. 75th St., No. 10
Prairie Village, Kan. 66208

Systronics Inc.
8005 W. 110th St., No. 110
Overland Park, Kan. 66210

Technical Writers Group
2303 South Early
Kansas City, Kan. 66102

Universal Systems of America
4550 W. 109th St., Suite 150
Overland Park, Kan. 66211

Viking Computing, Inc.
11111 W. 95th St.
Shawnee Mission, Kan. 66214

Vistar Systems, Inc.
206 W. 94th St.
Kansas City, Mo. 64114

Western Telecommunications
324 E. 11th St.
Kansas City, Mo. 64106

The Write Stuff
10220 N. Executive Hills, Suite 410
Kansas City, Mo. 64153

Computer System Manufacturers/Computer Hardware Manufacturers

Adacom Corporation
8871 Bond St.
Overland Park, Kan. 66214

Intel Corporation
7400 W. 110th St., No. 170
Overland Park, Kan. 66210

Lee Data Corp.
6600 College, Suite 210
Overland Park, Kan. 66211

Momentum System Inc.
6701 W. 63rd St., No. 110
Shawnee Mission, Kan. 66202

Strategic Product Designs
5613 Johnson Drive
Mission, Kan. 66202

Systems Manufacturing, Inc.
12901 W. 151st St.
Olathe, Kan. 66062

Tallgrass Technologies
11100 W. 82nd St.
Overland Park, Kan. 66214

Texas Instruments
8080 Ward Parkway
Kansas City, Mo. 64114

Wang Laboratories Inc.
7000 Squibb Road, Suite 300-W
Mission, Kan. 66202

Westport Research Associates, Inc.
6102 Arlington
Raytown, Mo. 64133

Wright Line Inc.
12401 E. 43rd St., No. 157
Independence, Mo. 64055

Advance Technical Training

Deltak Inc.
6600 College Blvd., Suite 220
Overland Park, Kan. 66211

Science Pioneers
425 Volker Blvd.
Kansas City, Mo. 64110

Communications

AT & T Consumer Products
9501 W. 67th
Shawnee Mission, Kan. 66203

AT & T Technology Systems
777 N. Blue Parkway
Lee's Summit, Mo. 64063

Centel Business Systems Telecommunications
8900 Nieman Road
Overland Park, Kan. 66214

Connex International
947 Massachusetts
Lawrence, Kan. 66044

Contel Executone
8875 Quivira
Overland Park, Kan. 66215

GTE Information Systems
127 W. 10th
Kansas City, Mo. 64105

GTE Sprint Communications
106 W. 14th St.
Kansas City, Mo. 64105

IBM-Rolm Systems
10000 Marshall Dr.
Lenexa, Kan. 66215

K.C. Marine Operator
1925 Baltimore Ave.
Kansas City, Mo. 64108

Menta Technology, Inc.
9015 W. 51st.
Merriam, Kan. 66203

Micro Tel
6864 W. 153rd St.
Overland Park, Kan. 66223

Mid America Long Distance Co.
5700 Broadmoor
Mission, Kan. 66206

Midwest Communications
9015 W. 51st
Merriam, Kan. 66203

Minor-Suma Corporation
4428 Belleview
Kansas City, Mo. 64111

Pay Phones
4747 Troost
Kansas City, Mo. 64110

Professional Telecommunications Series, Inc.
7735 Washington Avenue
Kansas City, Kan. 66112

Quintrex
9185 Bond
Overland Park, Kan. 66214

Sat Pro
1522 E. 23rd
Independence, Mo. 64055

Southwestern Bell Telephone
5400 Fox Ridge Dr., Room 508
Mission, Kan. 66202

Telco, USA, Ltd.
8833 Bond Street
Overland Park, Kan. 66214

Telesciences
1222 Ozark
Kansas City, Mo. 64116

United Telecommunications, Inc.
2330 Shawnee Mission Pkwy.
Westwood, Kan. 66205

USA 800
6608 Raytown Road
Raytown, Mo. 64133

Engineering & Design Services

A.C. Kirkwood & Associates P.C.
8080 Ward Parkway
Kansas City, Mo.

Applied Microwave Corp.
Rt. 6, Box 205A
Lawrence, Kan. 66046

E.T. Archer & Co.
1310 E. 104th St.
Kansas City, Mo.

Black & Veatch
1500 Meadow Lake Pkwy.
Kansas City, Mo.

Bulgren & Burnett, Inc.
P.O. Box 1072
Lawrence, Kan. 66044

Burns & McDonnell

P.O. Box 419173
Kansas City, Mo. 64141

George Butler Associates Inc.
8207 Melrose Dr.
Lenexa, Kan.

Center for Research in Computer-Controlled Automation
Durland Hall, Kansas State Univ.
Manhattan, Kan. 66506

Center for Productivity Enhancement
Campus Box 146
Wichita, Kan. 67208

Clark, Richardson & Biskup
Consulting Engineers, Inc.
2701 Rockcreek Pkwy., Suite 111
No. Kansas City, Mo. 64117

Design Lab III
258 W. Third St.
Kansas City, Mo. 64105

Designers Prototype
913 W. 45th
Kansas City, Mo. 64111

Detrek Engineering
12314 W. 73rd Terr.
Shawnee Mission, Kan. 66216

Eagle Systems Engineering Inc.
1007 S.W. Orrington Pl.
Lee's Summit, Mo. 64063

Envirex Inc.
8615 Rosehill Road No. 101
Shawnee Mission, Kan. 66215

Howard Needles Tammen & Bergendoff
9200 Ward Pkwy.
Kansas City, Mo.

Lutz, Daily & Brain
6400 Glenwood St.
Overland Park, Kan.

Midwest Elect. Inc.
939 W. 8th St.
Kansas City, Mo. 64101-1205

Smith & Loveless Inc.
14040 Santa Fe Dr.
Lenexa, Kan. 66215

Stentar Engineering Co.
924 E. Park
Olathe, Kan. 66061

Surfaces Research & Application
P.O. Box 14706
Lenexa, Kan. 66215

The Shirley Company
1319 Central
Kansas City, Kan. 66102

Thermo Dynamics Corporation
9225 W. 53rd
Mission, Kan. 66104

UTEK Systems
1305 W. Cedar
Olathe, Kan. 66061

Volume 4

Appendix 3—Recent heavy and large projects in vicinity

Recent Heavy and Large Projects in the Vicinity of the SSC

Wolf Creek Generating Station, located 55 miles south of Topeka in Coffey County, Kansas, was constructed at a cost of $3.05 billion. The plant site covers approximately 10,000 acres, including a 5,000-acre cooling lake. The work permit was issued in May 1977, and the plant came on line in September 1985. The peak labor force was 5,018 construction workers in May 1984. The plant required in excess of 45 million work hours to construct. Over 5,000 manufacturers provided construction materials for the project. The plant contains more than 55 miles of piping, 845 miles of electrical cable, 125,000 cubic yards of high-strength concrete, and 12,500 tons of reinforcing steel. More than 150,000 drawings were prepared for the task of assembling the plant. There are 167 systems, each with its own assigned tasks. Wolf Creek currently employs about 1,000 people on site, with a support group of about 225 located in Wichita. Occupations range from maintenance to clerical to nuclear engineers.

Jeffrey Energy Center, located in Pottawatomie County approximately 45 miles northwest of Topeka, was constructed at a cost of $1.032 billion. Ground breaking on the site occurred in June 1974, and the plant became operational in October 1983. The peak labor force was approximately 2,800, with an estimated total construction labor force of 10,000.

Projects 1 and 2 of the La Cygne Energy Center, located in Linn County approximately 60 miles south of Kansas City, were constructed at a total cost of $430 million. Phase 1 of the La Cygne Energy Center was under construction from April 1969 to June 1973, and Phase 2 was under construction from May 1973 to May 1977.

The AT&T Building in downtown Kansas City, Missouri, was completed in early 1987 at a cost of $120 million. The 38-story office and retail structure is part of an ongoing urban-development effort in Kansas City. Construction began in July 1984, and was completed in February 1987. The peak construction labor force for the project is estimated at 500 laborers.

When completed in late 1987, One Kansas City Place, a 42-story office structure, will be the tallest building on the Kansas City skyline. Construction on the $65 million project began in July 1985, and is slated for completion in November 1987. The peak construction labor force for the project is estimated at approximately 375 laborers.

The Kansas Expo Center in Topeka was completed in March 1987. The budget for construction of the project was approximately $20 million. Ground breaking occurred in March 1985, and the project was completed in March 1987. An estimated 350 laborers were involved in construction of the project.

Construction projects overseen by the Kansas State Board of Regents account for approximately 75% of building construction projects managed by the State. Major construction projects (budgeted at $1 million or more) at Kansas State Regents Institutions currently under construction or design amount to more than $142.7 million. Current projects include:

The University of Kansas Medical Center in Kansas City

-construction of an animal-research laboratory, $5.5 million
-construction of a parking structure, $3.5 million
-renovation of the pediatrics inpatient-care facilities, $2.25 million

The University of Kansas in Lawrence

-renovation of the student union, $10 million with $6.5 million currently under construction
-renovation of the human-development center, $12 million
-renovation of the computer-science and mathematics building, $7.25 million
-construction of a science library, $13.9 million
-construction of a parking structure, $5.3 million
-construction of a physical plant garage, $1 million

Kansas State University in Manhattan

-construction of phase 1 of a chemistry/biology complex
-chemistry building, $10.2 million
-renovation and construction of an addition to Weber Hall, $7.2 million
-construction of an ion-collision facility, $1.1 million
-construction of an education-communications center, $4 million
-construction of Bramlage Coliseum, $17.5 million

Wichita State University in Wichita

-construction of a library addition, $10.75 million
-construction of a science building, $12.6 million
-construction of a facility for the Institute for Aviation Research, $10.2 million

Emporia State College in Emporia

-renovation of the student union, $2 million

Fort Hays State College in Fort Hays

-construction of Sheridan Coliseum, $6 million

Major building-construction projects (budgeted at $1 million or more) at Kansas State Board of Regents

institutions which have been completed since 1979 amount to more than $190 million.

A linear accelerator is currently under construction at the Macdonald Laboratory on the campus of Kansas State University, in Kansas. The building addition to house the linear accelerator is being financed by the university at a cost of approximately $1.1 million. The linear accelerator is being constructed with $3.5 million of Federal funds.

The Kansas Department of Transportation indicates that in July 1987, there are 432 contractors pre-qualified by the state to do highway-construction work amounting to approximately $6.2 billion. Contractors annually submit an application for pre-qualification. Contractors filing an application are requested to include information regarding personnel, liabilities, assets, equipment, net worth, and previous experience. These applications are reviewed by a State committee, and the contractor is given a rating. After completion of a State job, various individuals involved with the project are asked to fill out a contractor-rating questionnaire. From this questionnaire, contractors are given a rating based on their past performance. A contractor's net worth is multiplied by the weighting factor given the contractor to determine the dollar amount of work the contractor is pre-qualified to do within the state.

Volume 4

Appendix 4—Population of cities of 1,000 or greater within 100 miles of site

Population of Cities of 1,000 or Greater within 100 Miles of Kansas SSC

City	Road Miles from North Campus	Road Miles from South Cluster	Population 1980 U.S. Census	Direction from Ring
Baldwin City, KS	27	39	2,829	E
Bonner Springs, KS	65	71	6,266	NE
De Soto, KS	54	66	2,061	NE
Edgerton, KS	33	45	1,214	E
Eudora, KS	47	59	2,934	NE
Gardner, KS	42	54	2,392	E
Lawerence, KS	36	48	52,738	NE
Olathe, KS	51	63	37,258	E
Oskaloosa, KS	55	67	1,092	NE
Spring Hill, KS	58	70	2,005	E
Tonganoxie, KS	48	60	1,864	NE
Valley Falls, KS	72	84	1,189	N
Wellsville, KS	36	40	1,612	E
Atchison, KS	85	97	11,407	N
Bonner Springs, KS	74	86	6,266	NE
Edwardsville, KS	64	76	3,364	NE
Fairway, KS	74	86	4,619	NE
Horton, KS	74	86	2,130	N
Kansas City, KS	74	86	161,087	NE
Lake Quivira, KS	74	86	1,087	NE
Lansing, KS	69	81	5,307	NE
Leavenworth, KS	74	86	33,656	NE
Leawood, KS	74	86	13,360	NE
Lenexa, KS	65	77	18,639	NE
Merriam, KS	70	82	10,794	NE
Mission, KS	74	86	8,643	NE
Mission Hills, KS	74	86	3,904	NE
Olathe, KS	51	63	37,258	E
Overland Park, KS	68	80	81,784	E
Prairie Village, KS	73	85	24,657	NE
Roeland Park, KS	74	86	7,962	NE
Shawnee, KS	65	77	29,653	NE
Westwood, KS	74	86	1,783	NE
Belton, MO	78	90	12,708	E
Blue Springs, MO	94	105	25,927	NE
Claycomo, MO	78	90	1,671	NE
Gladstone, MO	76	88	24,990	NE
Grandview, MO	82	94	24,561	E
Greenwood, MO	83	95	1,325	E
Independence, MO	93	105	111,806	N
Kansas City, MO	78	90	448,159	N
Lee's Summit, MO	84	96	28,741	N
Liberty, MO	93	105	16,251	E
North Kansas City, MO	83	95	4,507	N
Parksville, MO	88	100	2,091	N

City	Road Miles from North Campus	Road Miles from South Cluster	Population 1980 U.S. Census	Direction from Ring
Peculiar, MO	81	93	1,571	E
Platt City, MO	110	122	2,114	N
Pleasant Hill, MO	98	110	3,301	E
Pleasant Valley, MO	83	95	1,545	N
Raymore, MO	94	106	3,154	E
Raytown, MO	89	101	31,831	E
Riverside, MO	80	92	3,206	N
Smithville, MO	101	113	1,873	N
Weatherby Lake, MO	80	92	1,446	N
Weston, MO	84	96	1,440	N
Elwood, KS	117	129	1,275	N
Hiawatha, KS	110	122	3,702	N
Troy, KS	103	115	1,240	N
Wathena, KS	113	125	1,418	N
Buckner, MO	108	120	2,848	N
Country Club Villa, MO	118	130	1,234	N
Excelsior Springs, MO	101	113	10,424	N
Gower, MO	108	120	1,276	N
Grain Valley, MO	96	107	1,327	N
Holden, MO	101	113	2,195	E
Kearney, MO	108	120	1,433	N
Lake Lotawana, MO	97	108	1,875	E
Odessa, MO	108	120	3,088	E
Plattsburg, MO	123	135	2,095	N
Saint Joseph, MO	115	127	76,691	N
Ottawa, KS	39	27	11,016	E
Garnett, KS	64	52	3,310	SE
Osawatomie, KS	71	59	4,459	E
Paola, KS	65	53	4,557	E
Chanute, KS	90	78	10,506	S
Humboldt, KS	93	81	2,230	S
Iola, KS	83	71	6,938	S
La Cygne, KS	94	82	1,025	SE
Louisburg, KS	71	59	1,744	E
Pleasanton, KS	104	92	1,303	SE
Adrian, MO	113	125	1,484	E
Harrisonville, MO	96	108	6,372	E
Erie, KS	111	99	1,415	S
Fort Scott, KS	123	111	8,893	SE
Girard, KS	141	129	2,888	SE
Appleton City, MO	139	127	1,257	SE
Butler, MO	115	103	4,107	SE
Nevada, MO	144	132	9,044	SE
Rich Hill, MO	124	112	1,471	SE
Lyndon, KS	12	0	1,132	S
Osage City, KS	19	11	2,667	SW
Burlington, KS	41	29	2,901	S
Council Grove, KS	53	47	2,381	W
Emporia, KS	50	38	25,287	SW
Eureka, KS	98	86	3,425	SW

City	Road Miles from North Campus	Road Miles from South Cluster	Population 1980 U.S. Census	Direction from Ring
Herington, KS	77	70	2,930	W
Yates Center, KS	63	51	1,998	S
El Dorado, KS	106	94	10,510	SW
Hillsboro, KS	109	97	2,717	W
Neodesha, KS	123	111	3,414	S
Peabody, KS	106	94	1,474	SW
Burlingame, KS	10	18	1,239	W
Carbondale, KS	2	14	1,518	N
Topeka, KS	21	33	115,266	N
Rossville, KS	37	49	1,045	NW
St. Marys, KS	45	57	1,598	NW
Silver Lake, KS	32	44	1,350	NW
Wamego, KS	58	70	3,159	NW
Grandview Plaza, KS	91	103	1,189	W
Holton, KS	49	61	3,132	N
Junction City, KS	90	102	19,305	W
Manhattan, KS	72	84	32,644	NW
Ogden, KS	96	108	1,804	NW
Abilene, KS	110	122	6,572	W
Blue Rapids, KS	102	114	1,280	NW
Clay Center, KS	112	124	4,948	NW
Frankfort, KS	94	106	1,038	NW
Sabetha, KS	82	94	2,286	N
Seneca, KS	92	104	2,389	N
Solomon, KS	119	131	1,018	W

Volume4

Appendix 5—Employment opportunities within one-hour's driving time of site

Employment Opportunities within One-hour's Driving Distance of the SSC Site

Appendix 5 is a listing of the largest employers (firms employing 10 or more persons) in the principal cities of the counties surrounding the SSC site. The information is from the 1987 Dunn and Bradstreet Million Dollar Directory and the Kansas Department of Economic Development. This table is a detailed listing of the individual firms by city, SIC code, number of employees, annual sales, and product or service provided.

Firms	# of Employees	Sales ($1M)	Product/Service
Topeka, Kansas, Community Profile			
Adams Business Forms SIC 2761 2752 p 50	365	25	Manifold business forms, printing, lithographic
Alexander Brothers Baking Co. SIC 2051 p 105	90	N/A	Bread and other bakery products, except cookies &crackers
American Companies, Inc. SIC 2789 5199 p 167	230	13	Bookbinding and related work, Nondurable goods.
American Home Life Ins. Co. SIC 6311 6321 p 178	34	N/A	Life insurance; accident & health ins.
American Investors Life Ins. Co. SIC 6311 6321 p 181	70	N/A	Life insurance; accident & health ins
American Yearbook Co. Inc. SIC 2731 2732 p 203	2,600	N/A	Books: publishing &/or printing
Anco Construction Co. LTD SIC 1542 p 220	50	N/A	General contractors-non-residential buildings other than indus. bldg.
Andersen B.B. Const. Co. SIC 1542 p 221	350	31	General contractors-non-residential buildings other than indus. bldg.
Anderson Ray Co. Inc. SIC 5211 5031 p 227	13	3	Lumber & other bldg. materials dealers: lumber, plywood & millwork
AT & SF Employees Benefit Assn. SIC 6324 p 302	80	N/A	Hospital & medical service plans
AT & SF Railway Co..	2,765	N/A	Rail cars
Bank IV Topeka NA SIC 6025 p 390	260	N/A	National banks, mbrs. of FRS
Bartlett & West Engineers Inc	34	2	Engineering,

Firms	# of Employees	Sales ($1M)	Product/Service
SIC 8911 p 421			architectural & surveying
Beers Ray Clothing Co. Inc. SIC 5611 5621 5661 p 472	50	N/A	Men's/boy's clothing & furnishing store; women's ready-to-wear store; shoe store
Big Tops SIC 5621 p 531	25	2	Women's ready-to-wear stores
Blake Gene Salons Inc. SIC 7231 p 554	24	800	Beauty shops
Blakely Crop-Hail Inc. SIC 6331 p 554	22	N/A	Fire, marine & casualty insurance
Blue Cross-Blue Shield	1,190	N/A	Insurance
Brackett Inc. SIC 3555 p 616	56	4	Printing trades machinery & equipment
BRB Contractors SIC 1541 1623 1629 p 631	250	25	Gen. contractors-indus. bldgs. & warehs.; heavy const.; water, sewer, pipe line, comm. & power line
Brimans Leading Jewelers Inc. SIC 5944 7631 p 644	12	1	Jewelry stores; watch, clock & jewelry repairs
C & W Thriftway Market Inc. SIC 5411 p 733	26	N/A	Grocery stores
C G F Industries Inc. SIC 0921 2752 3993 3568 7331 6513 p 736	720	30	Fish hatch. & preserv; lithographic; signs / displays; Mech. pwr. transmis. equip, nec.; direct mail adv serv; operators of apt.bldgs.
Capital Iron Works Co. Inc. SIC 3441 p 792	35	N/A	Fabricated structural metal
Capitol City Office Products SIC 5112 5021 p 795	24	3	Stationary supplies; furniture
Capitol Concrete Products SIC 3271 5039 5211 p 795	18	2	Concrete block & brick; constr. materials nec.; lumber & other bldgs. materials dealers

FIRMS	# OF EMPLOYEES	SALES ($1M)	PRODUCT/SERVICE
Capitol Fed. Svgs. & Ln. Assn. SIC 6122 p 795	440	N/A	Federal savings & loan associations
Cappers Insurance Service Inc. SCI 6411 p 799	25	1	Insurance agents, brokers, & service
Columbian Financial Corp. SIC 6025 p 1048	11	N/A	National banks, members of FRS
Columbian Financial Services SIC 6162 p 1048	11	N/A	Mortgage bankers & loan correspondents
Columbian Natl. Title Insur. Co. SIC 6361 p 1048	33	N/A	Title insurance
Columbian Securities Corp. SIC 6211 6531 1311 6411 p 1048	200	3	Security brkrs., dealers, & flotation cos.; agents, brkrs. & mgrs.; crude petro. & nat. gas; ins. agents, brkrs. & serv.
Commerce Bk. & Tr. SIC 6023 p 1056	98	N/A	State banks, no members of FRS, insured by the FDIC
Commerce Financial Corp. SIC 6023 7374 p 1057	98	N/A	State banks, no members of FRS, insured by the FDIC; data-processing services
Cook Flatt & Strobel Engs. PA SIC 8911 p 1129	60	2	Engineering, architectural & surveying
Dahlstrom-Ferrell Constr. Co. SCI 1541 p 1244	50	22	General contractors-indus. bldgs. and ware-houses
Deutz-Allis	268	N/A	Machinery
Dibbles Food Stores Inc. SIC 5411 p 1353	27	N/A	Grocery stores
Drywall Construction Inc. SIC 1742 p 1421	16	2	Plastering, drywall, acoustical & insulation work
Frito-Lay, Inc.	410	N/A	Snack foods
Ernest/Spencer Inc. SIC 1541 p 1570	20	5	General contractors-industrial bldgs. &

Firms	# of Employees	Sales ($1M)	Product/Service
			warehouses
Executive Manor Inc. SIC 7011 5812 5921 6711 p 1597	45	N/A	Hotels, motels & tourist courts; eating places; drug stores & propriety stores; holding companies
Falleys Inc. SIC 5411 2011 p 1620	1,300	210	Grocery stores; meat-packing plants
Famous Companies Inc. SIC 5182 p 1624	100	24	Wines and distilled alcoholic beverages
Fidelity State Bk. & Tr. Co. SIC 6022 p 1699	46	N/A	State banks, members of FRS
Florence Bob Contractor Inc. SIC 1742 1799 1752 6513 p 1812	25	3	Plastering, drywall, acoustical, insulation, flr. laying; special trade contrctrs. nec.; operators of apt. bldgs.
Gaines Foods General Merchandise Distrs. SIC 5122 5199 p 1962	240 100	N/A N/A	Pet foods Drugs, drug proprietaries & druggists sundries; nondurable goods
General Printing & Paper Inc. SIC 2752 p 1964	102	10	Commerical printing, lithographic
Goodyear Tire & Rubber Co.	200	N/A	Tires
Gremor Motor Inns Inc. SIC 7011 p 2095	288	N/A	Hotels, motels, & tourist courts
Hallmark Cards	884	N/A	Greeting cards
Harry's IGA Food Center Inc. SIC 5411 p 2209	180	19	Grocery stores
Herrmans Excavating Inc. SIC 179 p 2275	40	5	Excavating and foundation work
Highland Bancshares Inc. SIC 6711 6022 p 2293	62	N/A	Holding companies; State banks, member of FRS
Highland Park Bk. & Tr. SIC 6022 p 2294	62	N/A	State banks, members of FRS
Highway Oil Inc. SIC 5541 p 2296	400	250	Gasoline service stations
Hill & Co Inc. SIC 5074 5063 p 2297	20	6	Plumbing & heating equip & supplies (hydronics);

Firms	# of Eemployees	Sales ($1M)	Product/Service
			Elec apparatus & equip, wiring supplies & constr materials
Hill's Pet Products	250	N/A	Pet Foods
Jostens American Yearbook Co.	850	N/A	Yearbooks
Kansas Fire & Casualty Co. SIC 6331 p 2644	53	N/A	Fire, marine & casualty insurance
Kansas Mutual Insurance Co. SIC 6411 p 2644	15	3	Insurance agents, brokers, & service
Kansas Power & Light Co. SIC 4931 p 2644	6,700	1350	Electric & other services combined
Karlan C A Furniture Co. Inc. SIC 5712 p 2648	30	N/A	Furniture stores
Katch M & Co. Inc. SIC 5051 5093 5013 5531 p 2651	55	N/A	Metal serv centers & offices; Scrap & waste matter; Auto parts & supplies; Auto & home supply stores
Kaw Valley Electric Co-Op. Co. SIC 4911 p 2654	22	5	Electric companies & systems
Kaw Valley Produce Co. Inc. SIC 5141 6552 6531 5113 5148 5142 p 2654	20	N/A	Groceries, general line; Subdividers & dev. agts, brkrs, mgrs; Indus & personal serv paper; Fresh fruit & vegetables; Frozen foods
Kaw Valley State Bk. & Tr. Co. SIC 6023 p 2654 FDIC	59	N/A	State banks, not members of FRS insured by the
Knoll Welding Supply Inc. SIC 5084 5999 7394 p 2738	40	N/A	Industrial machinery & equip; Misc retail stores; Equipment rental &leasing services
Lapeka Inc. SIC 5181 p 2823	30	N/A	Beer and ale
Lee & Bueltel Construction Co. SIC 1542 1541 p 2855	30	N/A	General contractors-both industrial blgs &

Firms	# of Employees	Sales ($1M)	Product/Service
			warehouses & non-residetial bldgs other than indus bldgs/warehs
Lewis Toyota Inc. SIC 5511 p 2886	34	N/A	Motor vehicle dealers (new and used)
Litwin Borthers Inc. SIC 5651 p 2924	100	4	Family clothing stores
Lux-Witwer Co. Inc. SIC 5182 p 2977	30	7	Wines and distilled alcoholic beverages
M-C Industries Inc. SIC 3842 3079 p 2996	240	9	Orthopedic, prosthetic & surgical appliances & supplies; Miscellaneous plastics products
Mainline Printing Inc. SIC 2752 2751 p 3023	75	5	Commercial printing, lithographic, letterpress & screen
Marling Ed Stores Inc. SIC 5722 5712 p 3067	105	10	Household appliance stores; Furniture stores
Martin Tractor Co. SIC 5082 p 3082	210	40	Construction and mining machinery & equipment
McElroys Inc. SIC 1711 p 3136	75	N/A	Plumbing, heating (except electric) & airconditioning
McGivern J F Inc. SIC 1721 p 3139	30	2	Painting, paper hanging, and decorating
Menninger Foundation	1,050	N/A	Mental Health Care
Meisinger Beechcraft Inc. SIC 5599 p 3176	18	N/A	Automotive dealers
Merchants Bancorp SIC 6025 p 3190	300	N/A	National banks, members of FRS
Merchants Natl. Bk. SIC 6025 p 3192	270	N/A	National banks, members of FRS
Midwest Machine Works Inc. SIC 3599 p 3257	65	4	Machinery, except electrical
Munns Medical Supply Co. Inc. SIC 5086 p 3391	41	N/A	Professional equipment and supplies
Neon Tube Light Co. Inc. SIC 3993 7699 7394 p 3469	17	600	Signs & advert displays; Repair shops & reltd serv;

Firms	# of Employees	Sales ($1M)	Product/Service
			Equipment rental & leasing services
Noller Laird Ford Inc. SIC 5511 p 3513	150	3	Motor vehicle dealers (new and used)
Ohse Meat Producst Inc. SIC 2013 p 3602	220	45	Sausages & other prepared meat products
Patterson Advertising Agency SIC 7311 2752 p 3726	35	3	Advertising agencies; Commerical printing, lithograph
Pauline Farms Co-Op. Elev./Sply. SIC 5153 5191 5171 p 3730	15	6	Grain; Farm supplies; Petro bulk stations & terminals
Pepsi Cola Btlg Topeka Inc. SIC 2086 p 3772	72	6	Bottle and canned soft drinks & carbonated waters
Physio Technology Inc. SIC 3693 5086 p 3811	85	6	Radiographic/fluoroscopic therapeutic X-ray & other X-ray apparatus & tubes; electromedical & electro-therapeutic apparatus; Professional equip & supplies
Pines Associates SIC 6513 p 3826	17	N/A	Operators of apartment buildings
RDA Companies Inc. SIC 1542 7394 p 3977	15	1	General contractors-non-residential bldgs other than indust bldgs & ware houses; Equip rental & leasing
Roach Hardware Inc. SIC 5251 p 4113	49	300	Hardware stores
Ross Sand Co Inc. SIC 3272 p 4164	15	1	Concrete products, except block & brick
Salisbury Supply Co. Inc. SIC 5082 5084 p 4230	17	3	Constr & mining machnry & equip; Indus machnry & equip
Sargent J C Mortgage & Div. Co. SIC 6162 p 4255	15	N/A	Mortgage banker and loan correspondents
Seven-Up Btlg. Co. Topeka Inc. SIC 2086 p 4354	50	6	Bottled and canned soft drinks & carbonated waters

Firms	# of Employees	Sales ($1M)	Product/Service
Seymour Foods Inc. SIC 3551 p 4357	60	2	Food products machinery
Shawnee Fed. Svgs. & Ln. Assn. SIC 6122 6552 p 4371	70	N/A	Fed svngs & ln assoc; Subdivdrs & devlprs exc cemeteries
Shawnee Services Inc. SIC 6552 p 4371	12	N/A	Subdividers and developers, except cemeteries
Southwestern Bell Telephone Co..	3,300	N/A	Communications
Stauffer Communications Inc. SIC 2711 4832 4833 p 4622	2,050	104	Newspapers: publishing/printing; Radio/ TV broadcasting
Stevenson Co. Inc. SIC 5081 1761 p 4622	60	5	Commercial machines & equip; Roofing & sheet metal work
Stormont-Vail Hospital	1,687	N/A	Health Care
Sunflower Rents Inc. SIC 7394 p 4681	15	653	Equipment rental & leasing services
Theracon Inc. SIC 7391 p 4802	19	881	Research and development laboratories
Topeka Board of Education	2,129	N/A	Public education
Topeka Capital Journal	350	N/A	Newspaper
Topeka Foundry & Iron Wks. Co. SIC 3441 3599 5211 p 4857	51	5	Fabricated structural metal; machinery exclud ing electrical, lumber and other building materials dealers
Topeka Lumber Inc. SIC 5211 5039 p 4857	36	N/A	Lumber & other building materials dealer, construc-tions materials
Topeka Svgs. Assn. Inc. SIC 6123 p 4857	36	N/A	State savings & loan association, insured by FSLIC
Topeka Truck Plaza Inc. SIC 5541 7538 5947 p 4857	27	5	Gasoline service stations; general auto repair shops; gift, novelty & souvenir shops
Topeka Waste Systems Inc. SIC 4953 p 4857	27	2	Refuse systems

Firms	# of Employees	Sales ($1M)	Product/Service
Turner Harry & Associates Inc. SIC 7311 p 4934	70	3	Advertising agencies
Van Doren-Hazard-Stallings Inc. SIC 8911 p 5046	75	3	Engineering, architectural, & surveying services
Vanguard Products Corp. SIC 3272 p 5053	34	3	Concrete products, except block & brick
V.A. Hospital	1,253	N/A	Health Care
Vincents Western Wear SIC 5699 5941 p 5086	8	350	Misc apparel & accessory stores; sporting goods stores, bicycle shops
Vista Inc. SIC 5812 p 5092	105	N/A	Eating places
Volume Shoe Corp. SIC 5661 5631 5139 p 5098	10,300	543	Shoe stores; Women's accessory & specialty stores; footwear
Whelans Inc. SIC 5211 5031 2431 p 5241	140	20	Lumber & other bldg materials dlrs; lumber, plywood & millwork
Wilch Mfg. Inc. SIC 3585 3599 p 5265	40	2	Air conditioning & warm air heating equipment, commercial & industrial refrig; machinery electrical
Wolfe Camera Shops Inc. SIC 5946 5043 p 5317	33	5	Camera & photo supply stores; photo equipment and supplies
Workingmans Friend Oil Co. SIC 5541 p 5335	120	N/A	Gasoline service stations
Yarrington Vic Oldsmobile Inc. SIC 5511 p 5358	44	6	Motor vehicle dealers (new and used)
Youngs Inc. SIC 1711 p 5371	40	4	Plumbing, heating (except electric) & air conditioning
Zercher Photo Inc. SIC 7395 5946 5943 p 5382	80	2	Photofinishing labs; Camera & photo supply stores; Stationary stores
Zip Processing Inc. SIC 7374 P 5387	65	N/A	Data processing services

Firms	# of Employees	Sales ($1M)	Product/Service
Lawrence, Kansas, Community Profile			
Aeroquip Corp.	162	N/A	Railroad & vehicular equipment
Allen Press Inc. SIC 2752 p 121	110	N/A	Commercial printing, lithographic
Alvamar Inc. SIC 7992 5712 p 150	100	3	Furniture store Public golf course
Brown Cargo Van Inc. SIC 3713 p 664	50	3	Truck and bus bodies
California Inn Management Inc. SIC 7011 p 760	1,000	29	Hotel, motel and tourist court
Carson, Burger and Weekly, Inc.	44	N/A	
Century Homes Co Inc. SIC 5031 p 881	15	6	Lumber, plywood and millwork
Clark Jim Motors Inc. SIC 5511 p 977	30	N/A	Motor vehicle dealer (new & used)
Conrad Electric & Plumbing SIC 1731 1711 p 1100	12	500	Plumbing, heating (except electric), & air conditioning
Cooperative Farm Chemicals Assoc.	383	N/A	Chemicals/ fertilizers
Cutler Repaving Inc. SIC 1611 3531 p 1226	40	9	Highway & street construction, except elevated highways Construction machinery and equipment manufac turing
Douglas County Bank SIC 6023 p 1405	65	N/A	State bank, not member of FRS, insured by FDIC
Ergosyst Associates Inc. SIC 5961 p 1567	22	1	Mail order house
Farmers CO-OP Assn. SIC 5153 5191 5541 p 1636	50	19	Gasoline service station Grain sales Farm supplies
FMC Corporation	152	N/A	Chemicals
First National Bank SIC 6025 p 1758	90	N/A	National bank, member of FRS

Firms	# of Employees	Sales ($1M)	Product/Service
Hallmark Cards, Inc.	825	N/A	Greeting cards & gift wrap
Huxtable & Associates Inc. SIC 1711 1731 p 2409	55	N/A	Plumbing, heating (except electric), & air conditioning, Electrical work
K-Mart Corporation	353	N/A	Retail sales
King Radio	211	N/A	Electronic components
Jayhawk Oil Co. Inc. SIC 5541 5172 p 2561	14	3	Petroleum and petroleum products, except bulk stations and groceries
L R M Industries Inc. SIC 3273 1611 5039 p 2789	45	N/A	Highway & street construction, except elevated high-ways, ready mixed concrete, construc tion materials
Lacy Steel Co. Inc. SIC 3441 p 2789	50	5	Fabricated structural metal
Lawrence Fed. Svgs. SIC 6123 p 2839	17	N/A	State savings & loan association, insured by FSLIC
Lawrence Natl. Bk. & Tr. Co. SIC 6025 p 2840	72	N/A	National bank, member of FRS
Lawrence Paper Co. SIC 2653 3079 p 2840	340	25	Corrugated & solid fiber box, miscellaneous plastic products
Maupintour Inc. SIC 4722 p 3105	160	55	Arrangement of passenger transportation
Packer Plastics	165	N/A	Plastic products
Quaker Oats Co.	127	N/A	Pet foods
Scotch Industries Inc. SIC 7211 7213 7216 p 4300	280	8	Power laundries; family and commercial linen supply, dry cleaning plant, except rug cleaning
Standard Mutual Life Ins. SIC 6311 p 4577	18	N/A	Life insurance carrier
Stokeley-Van Camp, Inc.	225	N/A	Food products
TRW Lawrence Cable Div.	91	N/A	Power petroleum cable

Firms	# of Employees	Sales ($1M)	Product/Service
Turner Chevrolet Inc. SIC 5511 p 4933 (new & used)	54	8	Motor vehicle dealers
University of Kansas	3,989	N/A	Education and research
Weavers Inc. SIC 5311 p 5169	70	3	Department store
Wolverene Aluminum Co.	13	N/A	Steel siding & related products
World Co. SIC 2711 4833 4899 p 5336	246	4	Newspaper; publishing, & printing, television broadcasting, communications services
Emporia, Kansas, Community Profile			
Blacktop Construction Co. Inc. SIC 1611 p 552	40	11	Highway and street construction, except elevated highways
Bluestem Farm & Ranch Supply SIC 5191 5072 p 569	50	N/A	Hardware & Farm supplies
Citizens National Bank & Trust SIC 6025 6162 p 960 FRS,	99	N/A	National bank, member of Mortagage bank and loan correspondent
Coca-Cola Bottling Inc. SIC 5149 p 1012	16	N/A	Groceries and related products
Columbia Savings Assn. SIC 6122 p 1047	140	N/A	Federal Saving & Loan Association
De Bauge Brothers SIC 5181 5149 2086 p 1290	32	N/A	Bottled and canned soft drinks and carbonated waters;Groceries, general beer and ale
Didde Graphic Systems Corp. SIC 3555 p 1357	515	47	Printing trades machinery and equipment
Dolly Madison Cake Co.	660	N/A	Cakes, donuts, & rolls
Educators Invest. Co. of KS Inc. SIC 6025 6799 p 1495	90	N/A	National bank, member of FRS Investors, nec
Emporia Motor Freight Inc. SIC 4213 p 1542	68	8	Trucking, except local
Emporia State Bk. & Tr. Co. SIC 6023 p 1542	46	N/A	State bank, not a member of FRS, insured by FDIC

Firms	# of Employees	Sales ($1M)	Product/Service
Fanestil Packing Co. Inc. SIC 2011 p 1624	67	14	Meat packing plant
Flint Hills Feed Lot Inc. SIC 0211 p 1810	16	N/A	Beef cattle feedlot
Hopkins MFG Corp. SIC 3999 3549 3991 3079 p 2357	150	22	Miscellaneous plastics products, metalworking machinery, brooms and brushes, manufacturing industries
Iowa Beef Porcessors, Inc.	2,292	N/A	Beef slaughtering and processing
Jones Jack Inc. SIC 0211 p 2607	16	4	Beef cattle feedlot
Kansas Corp. SIC 3554 p 2642	56	N/A	Paper industries machinery
Modine Manufacturing Co.	220	N/A	Passenger car and light radiators
North John Ford Inc. SIC 5511 p 3531	64	9	Motor vehicle dealer (new & used)
P & H Cattle Co. Inc. SIC 0211 0212 5154 p 3659	80	14	Beef cattle feedlots Beef cattle, except feedlots Livestock
Penny Ready Mxd. Concrete Co. SIC 3273 3271 1771 p 3759	17	2	Concrete work Concrete block and brick Ready mixed concrete
Reeble Inc. SIC 5411 p 4033	100	N/A	Grocery store
S & S Oil & Propane Co. Inc. SIC 5171 5722 p 4207	33	11	Household appliances Petroleum bulk, station and terminal
Stanley Jewelry Inc. SIC 5944 7631 p 4583	15	N/A	Jewelry store & Watch clock & jewelry repair
Temp & Co. Inc. SIC 5013 p 4772	12	N/A	Automotive parts & supplies
White Corp Inc. SIC 2711 p 5246	52	N/A	Newspaper; publishing, & printing

Firms	# of Employees	Sales ($1M)	Product/Service
Alma, Kansas, Community Profile			
Flint Hills Foods, Inc.	30	N/A	Processed meat products
Dwight-Alma Dairy Products	17	N/A	Cheese
Burlington, Kansas, Community Profile			
Burlington Schools	90	N/A	Education
Burns Security	70	N/A	Security
Caldwell Implement Co. SIC 5083 p 754	20	3	Farm & garden machinery
Country Critter Puppets	44	N/A	Hand puppets
Coffey County Hospital	54	N/A	Health care
Coffey County Today	17	N/A	Commercial printing
Daniels International	2,500	N/A	Contractor
Kansas Gas & Electric Co.	250	N/A	Power generation and supply
Osage City, Kansas, Community Profile			
Osage Products Company	215	N/A	Paper products
Ottawa, Kansas, Community Profile			
Bing-Go Dog Food Inc. SIC 2047 p 536	17	2	Dog, cat, and other pet food
Commodore Homes	65	N/A	Mobile homes
Fogle Quarry Co Inc. SIC 1422 p 1824	24	2	Mining crushed and broken limestone
Franklin Svgs. Assn. SCI 6123 p 1865	250	N/A	State Bank, not member FRS, insured by FDIC
Haven Steel	90	N/A	Steel Frames
Killough Inc. SIC 1422 1611 1622 p 2706	70	5	Mining crushed and broken limestone; Highway & street construction; Bridge tunnel, & elevated highways

Firms	# of Employees	Sales ($1M)	Product/Service
King Radio	355	N/A	Air craft radios
Lee Company	424	N/A	Jeans and jean jackets
Northern Oil Exploration SIC 1382 1381 p 2706	12	N/A	Drilling oil and gas wells; Energy exploration services
Ottawa Truck SIC 3537 p 3646	140	N/A	Industrial trucks, tractors, trailers
Parmelee Plastics	110	N/A	Eyeglass frames
Phoenix Corp. SIC 3531 p 3807	78	4	Construction machinery and equipment
Platner Industries	88	N/A	Combs and plastics
Rigid Form	46	N/A	Camper tops
Rome & Associates	16	N/A	Cabinets & storm doors
Skyhook Corp. SIC 3531 p 4436	70	N/A	Electric hoists
Stockyards Farmers Stores SIC 5399 p 4631	30	6	Miscellaneous general, inc merchandise stores

Volume 4

Appendix 6—Resolutions of support from surrounding communities and counties

RESOLUTION

RESOLUTION PASSED at the regularly scheduled meeting of the Commissioners of Franklin County, Ottawa Kansas at 9:00 a.m. on this 29th day of June, 1987.

WHEREAS, the United States Department of Energy has committed to constructing the Superconducting Super Collider for purposes of basic high energy physics research; and

WHEREAS, The Superconducting Super Collider represents a federal investment of $4.4 billion which will provide long sought answers to the most fundamental questions of science; yield long term benefits to science, medicine, commerce and industry; and enhance America's pre-eminent position in research and scientific inquiry; and,

WHEREAS, This Governor and Legislature of the State of Kansas have initiated a major effort to bring the Superconducting Super Collider and its attendant scientific and economic benefits to Kansas; and,

WHEREAS, This effort is wholly consistent with the longstanding commitment of the State of Kansas to develop new economic opportunities for our state and its people, and with the goals of the County of Franklin to insure economic progess for our current and future citizens.

NOW, THEREFORE, BE IT RESOLVED by the Commissioners of the County of Franklin that the United States Department of Energy be encouraged to locate the Superconducting Super Collider in the State of Kansas and, Further, that the Governor of Kansas, officials of the United States Department of Energy, and others associated with this decision be advised of the support of the Commissioners of the County of Franklin for this effort and the commitment of our community to assist in any possible way in the construction and operation of this facility.

Charles W. Mavity, Jr. Chariman

Earl Sink, Member

Merle Haas, Member

Laura Sutton
County Clerk

RESOLUTION NO. 87-31

WHEREAS, the United States Department of Energy has committed itself to constructing the Superconducting Super Collider for purposes of basic high energy physics research; and

WHEREAS, the Superconducting Super Collider represents a federal investment of $4.4 billion which will provide long sought answers to the most fundamental questions of science; yield long term benefits to science, medicine, commerce and industry; and enhance America's pre-eminent position in research and scientific inquiry; and,

WHEREAS, the Governor and Legislature of the State of Kansas have initiated a major effort to bring the Superconducting Super Collider and its attendant scientific and economic benefits to Kansas; and,

WHEREAS, this effort is wholly consistent with the long-standing commitment of the State of Kansas to develop new economic opportunities for our state and its people, and with the goals of Douglas County, Kansas to insure economic progress for our current and future citizens; and

WHEREAS, the Board of Commissioners of Douglas County, Kansas adopted Resolution No. 85-7 affirming its commitment to economic growth and new jobs for the citizens of Douglas County.

NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF COUNTY COMMISSIONERS OF DOUGLAS COUNTY, KANSAS, that the United States Department of Energy be encouraged to locate the Superconducting Super Collider in the State of Kansas; and

BE IT FURTHER RESOLVED, that the Governor of Kansas, officials of the United States Department of Energy, and others associated with this decision be advised of the support of the Board of County Commissioners of Douglas County, Kansas for this effort and the commitment of our County to assist in any possible way in the construction and operation of this facility.

ADOPTED this 8th day of July, 1987

BOARD OF COUNTY COMMISSIONERS
OF DOUGLAS COUNTY

David C. Hopper
David C. Hopper, Chairman

Warren Rhodes
Warren Rhodes, Member

ATTEST:

Patty Jaimes
Patty Jaimes, County Clerk

Nancy B. Hiebert
Nancy B. Hiebert, Member

COUNTY COMMISSIONERS:

ROSS D. BOND
Scranton-First District

DOROTHY H. SHOUP
Scranton-Second District

NEAL W. THORNE
Osage City-Third District



VIRGINIA KERSTEN
Clerk

OFFICE OF THE COUNTY CLERK
OSAGE COUNTY
LYNDON, KANSAS 66451

June 24, 1987

RECEIVED
JUN 26 9 10 AM '87
OFFICE OF THE GOVERNOR

Governor Mike Hayden
Capitol Building
Topeka, Kansas 66612

Dear Governor Hayden:

The Osage County Commission is aware and has followed with interest the development of the State of Kansas' proposal to secure the particle accelerator or Superconducting Super Collider (SSC) project for Kansas. The Commission and other Osage County government officials will continue to provide information and to otherwise cooperate with state and national forces, as requested and feasible.

As the project has been described, the Commission is optimistic about the potential for Osage County, should the federal government decide to locate this facility in Osage County and adjoining counties. We appreciate the fact that the State's SSC project management team has continued to inform the Commission and the citizens of its goals and plans, and has been sensitive to our concerns for the County.

The Commission notes that such key areas of concern as roads, water supply, waste water treatment, and economic development policy, along with at least temporary potential loss of property taxes, are being addressed.

We believe the location of the project in Osage County can offer singular opportunities to our current and future citizens and that, with the assistance of the State of Kansas, we can take full advantage of the opportunities presented by this new federal facility.

Accordingly, the Commission has adopted the attached Resolution in support of the project as proposed by the State of Kansas.

Sincerely,

BOARD OF COUNTY COMMISSIONERS
OSAGE COUNTY, KANSAS

Dorothy H. Shoup

Dorothy H. Shoup, Chairman

Ross D. Bond

Ross D. Bond, Commissioner

Neal W. Thorne

Neal W. Thorne, Commissioner

cc: Larry Emig
Kansas Department of Transportation
Bureau of Rural and Urban Development
Docking State Office Building
Topeka, Kansas 66612

Terry Smith
Kansas Technology Enterprise Corporation
Suite 500
400 S.W. 8th Street
Topeka, KS 66603

R E S O L U T I O N

WHEREAS, the United States Government has requested proposals in order to select the best site for the construction of a high energy research facility, the Superconducting Super Collider (SSC);

WHEREAS, the State of Kansas is preparing an application which would place the major portion of the SSC facility within Osage County;

WHEREAS, the State of Kansas has offered to provide the services of an economic development planning team to assist the County in addressing the impacts of the SSC on Osage County;

WHEREAS, because of a unique combination of factors and conditions, Osage County appears to be an ideal site for the SSC project, which could be a great asset to our County and to the State of Kansas; now

THEREFORE BE IT RESOLVED, that the Osage County Board of Commissioners supports the proposal, as it has been presented by the management team and other State of Kansas officials, to place the SSC project in Osage County, Kansas.

Dated this 24th day of June, 1987 at the Osage County Courthouse, Lyndon, Kansas.

BOARD OF COUNTY COMMISSIONERS
OSAGE COUNTY, KANSAS

Dorothy H. Shoup
Dorothy H. Shoup, Chairman

Ross D. Bond
Ross D. Bond, Commissioner

Neal W. Thorne
Neal W. Thorne, Commissioner

ATTEST:

Virginia Kersten
Virginia Kersten
Osage County Clerk

RESOLUTION No. 575

RESOLUTION PASSED at the regularly scheduled meeting of the Governing Body of the City of Osage City, Kansas, held at Osage City, Kansas, on this 14th day of July, 1987.

Whereas, the United States Department of Energy has commited to constructing the Superconducting Super Collider for purposes of basic high energy physics research; and

WHEREAS, The Superconducting Super Collider represents a federal investment of $4.4 billion which will provide long sought answers to the most fundamental questions of science; yield long term benefits to science, medicine, commerce and industry; and enhance America's pre-eminent position in research and scientific inquiry; and,

WHEREAS, The Governor and Legislature of the State of Kansas have initiated a major effort to bring the Superconducting Super Collider and its attendant scientific and economic benefits to Kansas; and,

WHEREAS, This effort is wholly consistent with the longstanding commitment of the State of Kansas to develop new economic opportunities for our state and its people, and with the goals of the City of Osage City to insure economic progress for our current and future citizens.

NOWTHEREFORE, BE IT RESOLVED BY THE Governing Body of the City of Osage City that the United States Department of Energy be encouraged to locate the Superconducting Super Collider in the State of Kansas and, Further, that the Governor of Kansas, officials of the United States Department of Energy, and others associated with this decision be advised of the support of the Governing Body of the City of Osage City of Kansas for this effort and the commitment of our community to assist in any possible way in the construction and operation of this facility.

Passed this 14th day of July, 1987.

Mayor

ATTEST:

City Clerk

(SEAL)

City of Overbrook

Phone 665-7328
Overbrook, Kansas 66524

RESOLUTION NO. 20

BE IT RESOLVED BY THE GOVERNING BODY OF THE CITY OF OVERBROOK, KANSAS.

WHEREAS, The United States Department of Energy has committed to constructing the Superconducting Super Collider for purposes of basic high energy physics research; and

WHEREAS, The Superconducting Super Collider represents a federal investment of $4.4 billion which will provide long sought answers to the most fundamental questions of science; yield long term benefits to science, medicine, commerce and industry; and enhance America's pre-eminent position in research and scientific inquiry; and,

WHEREAS, The Governor and Legislature of the State of Kansas have initiated a major effort to bring the Superconducting Super Collider and its attendant scientific and economic benefits to Kansas; and,

WHEREAS, This effort is wholly consistent with the longstanding commitment of the State of Kansas to develop new economic opportunities for our state and its people, and with the goals of the CITY of OVERBROOK, KANSAS to insure economic progress for our current and future citizens.

NOW, THEREFORE BE IT RESOLVED by the Governing Body of the CITY of OVERBROOK, KANSAS that the United States Department of Energy be encouraged to locate the Superconducting Super Collider in the State of Kansas, and Further, that the Governor of Kansas, officials of the United States Department of Energy, and others associated with this decision be advised of the support of the Governing Body of the CITY of OVERBROOK, KANSAS for this effort and commitment of our community to assist in any possible way in the construction and operation of this facility.

ADOPTED this 8th day of JULY, 1987 by the GOVERNING BODY of the CITY of OVERBROOK, KANSAS.

DENNIS POST
MAYOR

ATTEST:

MILDRED J. CANNON
CITY CLERK

Mayor JAMES R. WISCHROPP council Members ALDEN CHRISTESEN CHARLOTTE MANNING ELLIS ENGLISH DOUG PABST GLENN WARREN

city of lyndon KANSAS 66451

city office 230 Topeka Avenue 828-4902

RESOLUTION

RESOLUTION PASSED, at the regularly scheduled meeting of the Governing Body of the City of Lyndon, Kansas, held at City Hall on July 6, 1987.

WHEREAS, the United States Department of Energy has committed to constructing the Superconducting Super Collider for purposes of basic high energy physics research; and

WHEREAS, The Superconducting Super Collider represents a federal investment of $4.4 billion which will provide long sought answers to the most fundamental questions of science; yield long term benefits to science, medicine, commerce and idustry; and enhance American's pre-eminent position in research and scientific inquiry; and,

WHEREAS, The Governor and Legislature of the State of Kansas have initiated a major effort to bring the Superconducting Super Collider and its attendant scientific and economic benefits to Kansas; and,

WHEREAS, This effort is wholly consistent with the long-standing commitment of the State of Kansas to develop new economic opportunities for our state and its people, and with the goals of the City of Lyndon to insure economic progress for our current and future citizens.

NOW, THEREFORE, BE IT RESOLVED by the City Council of Lyndon that the United States Department of Energy be encouraged to locate the Superconducting Super Collider in the State of Kansas and, Further, that the Governor of Kansas, officials of the United States Department of Energy, and others associated with this decision be advised of the support of the Council of the City of Lyndon for this effort and the commitment of our community to assist in any possible way in the construction and operation of this facility.

We, the City Council of Lyndon recognize the potential importance of the U. S. Department of Energy's Superconduction Super Collider for our community and pledge our support and cooperation to the State of Kansas' efforts to secure this project. Should the state be successful in this effort, we pledge our continued cooperation during the planning, construction and operation of the Super-conducting Super Collider.

CITY OF LYNDON July 6, 1987 James R. Wischropp, Mayor

Opal G. White, City Clerk

THE CITY OF BURLINGAME
101 E. Santa Fe Burlingame, Kansas 66413 (913) 654-2414

RESOLUTION 6-87-1

A RESOLUTION RECOGNIZING THE POTENTIAL IMPORTANCE OF THE U.S. DEPARTMENT OF ENERGY'S SUPERCONDUCTING SUPER COLLIDER FOR OUR COMMUNITY AND PLEDGING OUR SUPPORT AND COOPERATION TO THE STATE OF KANSAS' EFFORTS TO SECURE THIS PROJECT.

RESOLUTION PASSED at the regularly scheduled meeting of the Governing Body of the City of Burlingame, Kansas, held at Burlingame on this 22nd day of June, 1987.

WHEREAS, The United States Department of Energy has committed to constructing the Superconducting Super Collider for purposes of basic high energy physics research; and

WHEREAS, The Superconducting Super Collider represents a federal investment of $4.4 billion which will provide long sought answers to the most fundamental questions of science; yield long term benefits to science, medicine, commerce and industry; and enhance America's pre-eminent position in research and scientific inquiry; and,

WHEREAS, The Governor and Legislature of the State of Kansas have initiated a major effort to bring the Superconducting Super Collider and its attendant scientific and economic benefits to Kansas; and,

WHEREAS, This effort is wholly consistent with the long-standing commitment of the State of Kansas to develop new economic opportunities for our state and its people, and with the goals of the City of Burlingame to insure economic progress for our current and future citizens.

NOW, THEREFORE, BE IT RESOLVED, by the Governing Body of the City of Burlingame, Kansas that the United States Department of Energy be encouraged to locate the Superconducting Super Collider in the State of Kansas and, Further, that the Governor of Kansas, officials of the United States Department of Energy, and others associated with this decision be advised of the support of the City of Burlingame, Kansas, for this effort and the commitment of our community to assist in any possible way in the construction and operation of this facility.

WE, the Governing Body of the City of Burlingame, Kansas, recognize the potential importance of the U. S. Department of Energy's Superconducting Super Collider for our community and pledge our support and cooperation to the State of Kansas' efforts to secure this project. Should the state be successful in this effort, we pledge our continued cooperation during the planning, construction and operation of the Superconducting Super Collider.

ADOPTED AND APPROVED this 22nd day of June, 1987.

Mayor Donald H Smith

ATTEST: Kenneth E Reed

City Clerk

RESOLUTION 1592

WHEREAS, The Department of Energy is actively pursuing a location for its Super Collider Project, and

WHEREAS, The State of Kansas Department of Commerce is promoting Eastern Kansas as a suitable location for this Super Collider facility, and

WHEREAS, The Emporia City Commission recognizes the scientific importance of this project and the significant economic impact it would have on the State of Kansas, this region, and the City of Emporia.

NOW, THEREFORE, be it resolved by the Emporia City Commission that the City of Emporia supports the State in its efforts to attract this industry to Kansas and will take steps necessary to assist the State in achieving this end.

DONE, this 1st day of July, 1987.

Evora A. Wheeler

Evora A. Wheeler, Vice-Mayor

ATTEST:

Susan Van Gundy

Susan Van Gundy, City Clerk

CITY OF EMPORIA, LYON COUNTY, KS
SEAL
1870

RESOLUTION NO 87-001

RESOLUTION PASSED at the regularly scheduled meeting of the Council Meeting of the Governing Body of the City of Carbondale, Osage County, Kansas held at the Carbondale City Hall on this 6 day of July, 1987.

WHEREAS, the United States Department of Energy has committed to constructing the Superconducting Super Collider for purposes of basic high energy physics research; and

WHEREAS,The Superconducting Super Collider represents a federal investment of $4.4 billion which will provide long sought answers to the most fundamental questions of science; yield long term benefits to science, medicine, commerce and industry; and enhance America's pre-eminent position in research and scientific inquiry; and,

WHEREAS, The Governor and Legislature of the State of Kansas have initiated a major effort to bring the Superconducting Super Collider and its attendant scientific and economic benefits to Kansas; and

WHEREAS, This effort is wholly consistent with the long-standing commitment of the State of Kansas to develop new economic opportunities for our state and its people, and with the goals of the City of Carbondale to insure economic progress for our current and future citizens.

NOW, THEREFORE, BE IT RESOLVED by the Governing Body of the City of Carbondale that the United States Department of Energy be encouraged to locate the Superconducting Super Collider in the State of Kansas and, Further, that the Governor of Kansas, officials of the United States Department of Energy, and others associated with this decision be advised of the support of the Governing Body of the City of Carbondale for this effort and the commitment of our community to assist in any possible way in the construction and operation of this facility.

We, the City Governing Body of City of Carbondale recognize the potential importance of the U. S. Department of Energy's Superconducting Super Collider for our community and pledge our support and cooperation to the State of Kansas' efforts to secure this project. Should the state be successful in this effort, we pledge our continued cooperation during the planning, construction and operation of the Superconducting Super Collider.

Vernon L Fullhage Date 7-8-87

Mayor City of Carbondale

OFFICE OF THE CITY CLERK

City of Quenemo

QUENEMO, KANSAS 66528

July 8,1987

We the Governing Body of the City of Quenemo, Kansas pledge our support and cooperation to the State of Kansas in its effort to secure the U.S. Department of Energys Superconducting Supper Collider. We recognize the importance of this project and will continue our support during the planning, construction and operation.

William L. Ragan

William L. Ragan
Mayor

The City of Melvern
Council Meets the First Wednesday of Each Month
Melvern, Kansas 66510

RESOLUTION PASSED at the regularly scheduled meeting of the City of Melvern, Kansas, held at the City Hall on this 3rd day of August, 1987.

WHEREAS, the United States Department of Energy has committed to constructing the Superconducting Super Collider for purposes of basic high energy physics research; and

WHEREAS, The Superconducting Super Collider represents a federal investment of $4.4 billion which will provide long sought answers to the most fundamental questions of science; yield long term benefits to science, medicine, commerce and industry; and enhance America's pre-eminent position in research and scientific inquiry; and,

WHEREAS, The Governor and Legislature of the State of Kansas have initiated a major effort to bring the Superconducting Super Collider and its attendant scientific and economic benefits to Kansas; and,

WHEREAS, This effort is wholly consistent with the long-standing commitment of the State of Kansas to develop new economic opportunities for our state and its people, and with the goals of the city of Melvern to insure economic progress for our current and future citizens.

NOW, THEREFORE, BE IT RESOLVED by the city of Melvern that the United States Department of Energy be encouraged to locate the Superconducting Super Collider in the State of Kansas and, Further, that the Governor of Kansas, officials of the United States Department of Energy, and others associated with this decision be advised of the support of the city of Melvern for this effort and the commitment of our community to assist in any possible way in the construction and operation of this facility.

We, the City Council of Melvern recognize the potential importance of the U.S. Department of Energy's Superconducting Super Collider for our community and pledge our support and cooperation to the State of Kansas' efforts to secure this project. Should the state be successful in this effort, we pledge our continued cooperation during the planning, construction and operation of the Superconducting Super Collider.

Howard M Kramer
Mayor

Raymond R. Williams
Councilmen

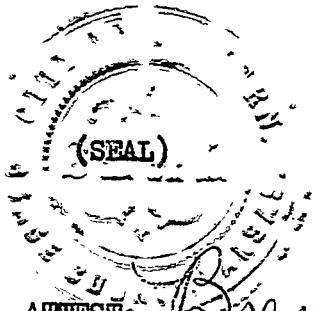
George D Rice
Councilmen

Councilmen

Ben Burch
Councilmen

Councilmen

APPROVED BY THE GOVERNING BODY OF MELVERN, KANSAS, this 3rd day of August, 1987.



ATTEST: Brenda N. Sage
City Clerk

Volume 4

Appendix 7—1987 Session Laws of Kansas, Chapter 327

CHAPTER 327 *

Senate Bill No. 430

AN ACT concerning the superconducting super collider; authorizing the acquisition of real property and interest or rights therein for certain purposes relating thereto; granting power of eminent domain under certain circumstances; granting certain rights to and imposing certain duties upon the secretary of commerce; authorizing entry upon land in certain circumstances; establishing the super collider project fund; authorizing the state corporation commission to determine the telecommunications provider and electric supplier for the superconducting super collider.

Be it enacted by the Legislature of the State of Kansas:

Section 1. (a) The department of commerce, acting through the secretary of commerce, in the name of the state, may acquire fee simple title or easement by gift, purchase, dedication or by the exercise of the right of eminent domain: (1) To, upon or under any lands or interests or rights therein; (2) to water, gravel, stone, sand or other material; (3) to spoil banks, borrow pits or disposal sites; (4) to access ways, to spoil banks or borrow pits or any bed, pit, quarry or other place where gravel, stone, water or other material or substance is located; (5) to access roads or utility easements necessary to serve lands or rights in land so acquired; and (6) to control access to the lands or rights in land so acquired, all in furtherance of the state acquisition of land for the superconducting super collider. The secretary of commerce, in the name of the state, may acquire title to an entire lot, block or tract of land for the superconducting super collider even though such entire lot, block or tract is not immediately needed for such purpose, if the secretary finds that by so doing the interests of the public will be best served, and without limiting the foregoing, the same may be done where uneconomic remnants of land would be left the original owner or where severance or consequential damage to a remainder make the acquisition of the entire lot, block or tract more economical to the state or where requested to do so by the owner of the lot, block or tract of land.

(b) (1) Exercise of the right of eminent domain by the secretary shall be in accordance with and governed by article 5 of chapter 26 of the Kansas Statutes Annotated.

(2) Every petition filed by the secretary to acquire lands or any interest in or title thereto by the exercise of the right of eminent domain shall set forth the extent, quantity and nature of the interest or title to be acquired.

(3) Except as otherwise provided in paragraph (b)(4), the secretary may subordinate but shall not acquire by eminent domain any right, title or interest in or to the oil and gas or other

minerals under or in any lands, and the petition in any condemnation proceedings shall state that right, title or interest in or to such oil and gas or other minerals is not being condemned but that the same may be subordinated to projects in furtherance of the superconducting super collider.

(4) The secretary may acquire by eminent domain the fee simple title to lands when such lands are acquired for sites for improvements necessary or incident to the superconducting super collider.

(c) The secretary may acquire fee simple title or any lesser degree of title, interest or rights in land by purchase, gift, dedication or exercise in the name of the state by the right of eminent domain in furtherance of the state acquisition of land for the superconducting super collider.

(d) The secretary may donate, sell or trade the real estate or any right, title or degree or variety of interest therein which has been acquired in accordance with the provisions of this section to the federal government or any agency thereof or any other person or entity.

(e) The secretary may enter into such contracts and agreements and perform such other duties as may be necessary to carry out the provisions of this section.

(f) The secretary may enter or authorize designees to enter upon any property to make surveys, examinations, investigations and tests and to acquire other necessary and relevant data in contemplation of the acquisition of land or rights in land pursuant to this section. Prior to entering upon any such property the secretary or designee shall first request permission of the landowner. Where consent to do the things authorized in this subsection (f) is not given to the secretary or designee by the owner or occupant of the land involved, the secretary or designee may proceed as authorized after giving 10 days' written notice to landowner or occupant of the secretary's or designee's intention to conduct such surveys, examinations, investigations and tests. Entry upon any property, pursuant to this subsection (f) shall not be considered to be a trespass and no damages shall be recoverable solely because of such entry.

(g) This section shall be part of and supplemental to the provisions of article 50 of chapter 74 of the Kansas Statutes Annotated and acts amendatory of the provisions thereof or supplemental thereto.

Sec. 2. (a) There is hereby established in the state treasury the super collider project fund which shall be administered by the secretary of commerce. All expenditures from such fund shall

be made upon warrants of the director of accounts and reports pursuant to vouchers approved by the secretary of commerce or the secretary's designee.

(b) Moneys in the super collider project fund shall be used only for the purposes of paying expenses relating to securing the location of the federal superconducting super collider project site in this state.

(c) Upon certification by (1) the federal department of energy to the governor that the state of Kansas has been selected as the official site of the superconducting super collider project and (2) the secretary of commerce to the director of accounts and reports that the unencumbered balance in the super collider project fund is insufficient to pay projected expenditures therefrom, the director of accounts and reports shall transfer an amount equal to the insufficiency from the state general fund to the super collider project fund, with the approval of the state finance council. Transfers pursuant to this subsection are hereby characterized as a matter of legislative delegation and subject to the guidelines prescribed in subsection (c) of K.S.A. 75-3711c and amendments thereto, except that such approval also may be given when the legislature is in session.

Sec. 3. (a) As used in this section: (1) "Telecommunications public utility" means any public utility, as defined in K.S.A. 66-104 and amendments thereto which owns, controls, operates or manages any equipment, plant or generating machinery, or any part thereof, for the transmission of telephone messages, as defined in K.S.A. 66-104 and amendments thereto in or through any part of Kansas.

(2) "Commission" means the state corporation commission.

(3) "Superconducting super collider project" means the United States department of energy particle accelerator facility.

(b) (1) This section recognizes the importance of the superconducting super collider project to Kansas' future economic development and thereby endeavors to enhance Kansas' opportunity of being awarded such a project.

(2) Subject to the provisions of this section, the commission shall have the authority upon application by a telecommunications public utility, to determine the telecommunications public utility to be responsible for providing all telecommunications service to the superconducting super collider project.

(c) (1) In determining which telecommunications public utility shall provide service to the superconducting super collider project, the commission shall select a telecommunications public utility which provides service in the territory where the

switch for the superconducting super collider project shall be located.

(2) The commission shall also ascertain that the telecommunications public utility selected is able to meet the specifications of the superconducting super collider project.

Sec. 4. (a) As used in this section: (1) "Electric transmission lines" means any line or extension of a line which is at least five miles in length and which is used for the bulk transfer of 230 kilowatts or more of electricity.

(2) "Retail electric supplier" means any person, firm, corporation, municipality, association or cooperative corporation engaged in the furnishing of retail electric service.

(3) "Certified territory" means an electric service territory certified to a retail electric supplier pursuant to K.S.A. 66-1,170 *et seq.* and amendments thereto.

(4) "Superconducting super collider project" means the United States department of energy particle accelerator facility.

(b) (1) This section recognizes the importance of the superconducting super collider project to Kansas' future economic development and thereby endeavors to enhance Kansas' opportunity of being awarded such project.

(2) Subject to the provisions of this section, the state corporation commission shall have the authority upon application by any retail electric supplier or group of suppliers, to determine the electric supplier or suppliers to be responsible for providing service to the superconducting super collider, including the termination of service rights and awarding of such service rights to another retail electric supplier.

(c) (1) Fair and reasonable compensation shall be paid to the terminated retail electric supplier by the supplier subsequently authorized to provide electric service. Such amount shall be an amount mutually agreed upon by the affected parties or the sum of the following:

(A) The depreciated replacement cost for the electric utility facilities in the territory in which the service rights have been terminated. As used in this paragraph, "depreciated replacement cost" means the original installed cost of the facilities, adjusted to present value by utilizing a nationally recognized index of utility construction costs, less accumulated depreciation based on the book depreciation rates of the selling utility as filed with and approved by the state corporation commission, which are in effect at the time of acquisition;

(B) all reasonable and prudent costs of detaching the electric system facilities to be sold and all reasonable and prudent costs

of reintegrating the remaining electric system facilities of the retail electric supplier whose service rights are terminated;

(C) an amount equal to 100% of the gross revenues attributable to the existing customers in the terminated territory during the 12 months next preceding the date of termination of the service rights; and

(D) an amount equal to the state and federal tax liability created by the taxable income pursuant to the provisions of this paragraph and paragraphs (A), (B) and (C) by the retail electric supplier whose service rights are terminated, calculated without regard to any tax deductions or benefits not related to the sale of assets covered herein.

(2) In the event that the parties are unable to agree upon an amount of compensation to be paid pursuant to subsection (c)(1), after 60 days following the date of termination of service rights either party may apply to the state corporation commission for determination of compensation. Such determination shall be made by the corporation commission within 60 days of such application.

(d) This section shall supersede those relevant portions of K.S.A. 66-1,170 *et seq.* and K.S.A. 66-1,177*et seq.*, and amendments thereto.

Sec. 5. This act shall take effect and be in force from and after its publication in the Kansas register.

Approved May 11, 1987.

Published in the *Kansas Register* May 14, 1987.

Volume 4

Appendix 8—Executive Order 87-98

Site Proposal for the Superconducting Super Collider

Kansas

Volume 5

Environment

For more information, contact:

SSC Project Office
Kansas Department of Commerce
400 W. 8th, Suite 500
Topeka, Kansas 66603
(913) 296-5272

Cover art from the original painting "*Explosion of Creation*" by Kansas artist Philomene Bennett

Cover design by Jennifer Sims, Kansas Geological Survey

Contents

5.1 WETLANDS 1
5.1.1 Description 1
5.2 SURFACE WATER 1
5.2.1 Major Features 1
5.2.2 Quantity 1
5.2.3 Quality 7
5.2.4 Flood Areas 10
5.3 FISH AND WILDLIFE 14
5.3.1 Fish and Wildlife Resources 14
5.3.2 Threatened or Endangered Species 14
5.4 VEGETATION 15
5.4.1 Description 15
5.4.2 Threatened and Endangered Species 15
5.5 AIR QUALITY 15
5.5.1 Existing Air Quality and Air-Quality Limitations 15
5.6 BACKGROUND RADIATION 16
5.6.1 Soil/rock and Ground-water Background Radioactivity 16
5.7 HISTORICAL AND ARCHEOLOGICAL RESOURCES 17
5.7.1 Description 17
5.8 PRELIMINARY ENVIRONMENTAL EVALUATION 19
5.8.1 Description of Impacts 19

Tables

5.1—Physical data for lakes in proposed SSC site 1
5.2—Water-resources stations in proposed SSC site 3
5.3—Categories of use and level of support of designated use 8
5.4—Water-quality standards for various water uses 9
5.5—Summary of water-quality data from Dragoon Creek 10
5.6—Summary of water-quality data fromHundred and Ten Mile Creek 11
5.7—Water-quality data from surface waters of Pomona Lake 12
5.8—Water-quality data for Lyndon City Lake, Osage County State Fishing Lake, and Strowbridge Reservoir 13
5.9—Means and maximum for air-quality parameters 16
5.10—Buildings and sites within the SSC project area potentially eligible for listing on National Register of Historic Places 18
5.11—Types and amounts of land which would be directly impacted by construction of the SSC19
5.12—Type and acreage of land potentially idled by acquisition for the SSC 21
5.13—Acreage, habitat-quality ratings, and habitat units 21
5.14—Economic impact on Kansas economy of construction of the SSC 25
5.15—Impact of construction of the SSC on the State budget of Kansas 26
5.16—Impact on Osage County government finances of construction of the SSC 27

Figures

5.1—Annual peak daily flows on Salt and Dragoon creeks 2
5.2—Lowest annual seven-day average flow on Salt and Dragoon creeks 3
5.3—Monthly flows of indicated duration in Dragoon Creek 4
5.4—Monthly flows of indicated duration in Salt Creek 4
5.5—Annual peak daily flow in Hundred and Ten Mile Creek 5
5.6—Lowest annual seven-day average flow in Hundred and Ten Mile Creek 5
5.7—Monthly flows of indicated duration in Hundred and Ten Mile Creek before impoundment by Pomona Lake 6
5.8—Monthly flows of indicated duration in Hundred and Ten Mile Creek after impoundment by Pomona Lake 6
5.9—Monthly pool elevations of Pomona Lake 7
5.10—Results of a computer simulation of water level in Pomona Lake with and without additional 3 mgd withdrawal for the SSC 22

Plates

5.1—Watershed map in back envelope
5.2—Floodplain map in back envelope
5.3—Potential vegetation and archeological sites map in back envelope
5.4—Land use map in back envelope

Volume 5—Environment

5.1. WETLANDS

5.1.1 Description

Wetlands are defined as areas of hydric soils which are saturated with water and have the appropriate vegetation. Potential wetland areas were identified by first locating hydric soils on Soil Conservation Service soils maps. These sites were then compared to high-resolution aerial photography (scale 1:24,000) to eliminate areas which were obviously row crop or forest. The remaining sites were visited and assessed according to vegetation. Typical wetland plants in this area are arrowhead, cattail, bulrush, sedge, and smartweed.

Only seven wetlands totaling 54 acres were identified on the proposed SSC site by the above process. The largest wetland identified was 38 acres and the rest were less than 4 acres each. One small wetland (3 acres) was located at the upstream end of Pomona Lake on Dragoon Creek. The rest were located near roads or railways where the construction of embankments had restricted drainage.

5.2 SURFACE WATER

5.2.1 Major Features

The majority of the proposed SSC site lies within the Marais des Cygnes River watershed. The northern portion of the site, including the campus and injector areas, lies within the Wakarusa River watershed (Plate 5.1, in back envelope). The Marais des Cygnes River is located south of the ring and flows in a southeasterly direction into Missouri and discharges into the Missouri River. The Wakarusa River is located north of the ring and flows east into the Kansas River. The southern portion of the site is drained by Salt Creek and the central portion is drained by Dragoon Creek and Hundred and Ten Mile Creek. The latter two streams flow into the dominant surface-water feature of the proposed site: Pomona Lake. The fact that the ring easily circumscribes this 4,000-acre U.S. Army Corps of Engineers (Corps) reservoir highlights the scale of this project. Three smaller lakes also occur in the project site. The water supply lake for the City of Lyndon and its watershed are located just off the southern edge of the ring. Osage County State Fishing Lake (OCSFL) is located south of the proposed injector area and its watershed extends into the southern portion of this area. Strowbridge Reservoir, the current water supply lake for the City of Carbondale, is located on the north side of the ring. The major north-south arm of this lake will pass over the ring and extend into the campus area. A large portion of the watershed for Strowbridge Reservoir is located on land which would be purchased for the SSC. Physical dimensions of these lakes are presented in Table 5.1.

5.2.2 Quantity

Daily flow records at three U. S. Geological Survey (USGS) gauging stations and monthly records for Pomona Lake were analyzed for baseline-flow characteristics and their seasonal variations. The stations and their pertinent data are listed in Table 5.2. Because flow characteristics of streams in this basin are similar, the

TABLE 5.1—PHYSICAL DATA FOR LAKES IN THE PROPOSED SSC SITE.

	Lyndon City Lake	Osage County State Fishing Lake	Strowbridge Reservoir	Pomona Lake C.P.*	Pomona Lake F.P.*
Surface area (acres)	72	140	246	4,000	8,600
Volume (acre-feet)	739	980	3112	66,640	176,500
Mean depth (feet)	13	7.0	12.7	16.6	20.5
Maximum depth (feet)	26	35	28	47	76
Watershed area (sq. miles)	1.45	2.57	5.09	322	

* C.P. and F.P. are conservation and flood pool, respectively.

records are generally representative of water resources in the proposed collider area.

Free-flowing streams, such as Dragoon Creek and Salt Creek, exhibit extreme variation of flow. Because of the lack of appreciable alluvial aquifers along the streams, runoff is essentially related to the rainfall pattern. Peak daily flows have averaged 4,120 cubic feet per second (cfs) and 3,220 cfs, respectively, on Dragoon Creek and Salt Creek (Figure 5.1), while seven-day low flows have averaged 0.4 and 0.3 cfs, respectively (Figure 5.2). Days of no flow have occurred in 17 of 25 years along Dragoon Creek and 27 of 46 years on Salt Creek.

Flow-duration curves confirm the predominance of runoff and lack of baseflow (Figures 5.3 and 5.4). Runoff occurs from March to June. Flow recedes sharply by mid-summer, and marginal baseflow occurs after August. During wet years, some flow may be expected from September to February, but a lack of baseflow is apparent most years. If median (50 percent) flow is taken as a baseline, then expected seasonal flows on these two streams range from 36 cfs to 1 cfs on Dragoon Creek and from 20.5 cfs to under 1 cfs on Salt Creek.

The influence of Pomona Lake is apparent in the record of Hundred and Ten Mile Creek. The reservoir began filling in 1964, and regulation of floods and low flows began in 1965. Thus, the annual peak daily flows on Hundred and Ten Mile Creek declined after 1964 from 7,500 to 2,240 cfs (Figure 5.5). Peak daily flows after 1964 on Dragoon and Salt creeks average 4,210 cfs and 3,540 cfs, respectively, indicating the reduction in daily peak flow on Hundred and Ten Mile Creek is not climate related. Low flows have averaged 13 cfs since 1964, significantly higher than the average of 1.3 cfs prior to 1964. Except for periods of structural maintenance or gate closure for flood control, flow has been present since 1964 (Figure 5.6).

The influence of Pomona Lake on the downstream flows is also seen in the flow-duration data for Hundred and Ten Mile Creek. Before Pomona Lake was operating, the seasonal flow pattern was similar to that of a free-flowing stream such as Dragoon and Salt creeks (Figure 5.7). Median flows ranged from 62 cfs to 2 cfs. Pomona Lake operations distorted the seasonal pattern of flow after 1964 (Figure 5.8). Relatively uniform flow is present from August to March and flood-control operations exhibit a solitary June peak. Baseflow enhancement by Pomona Lake storage is apparent in the late summer and fall.

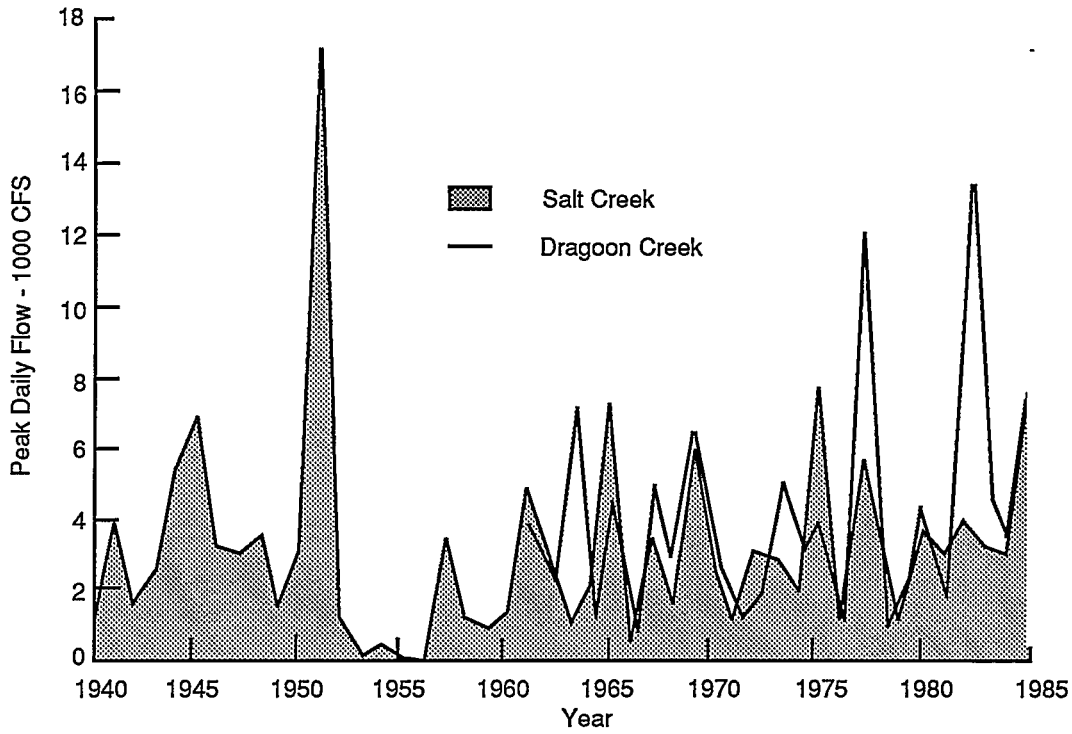


FIGURE 5.1—ANNUAL PEAK DAILY FLOWS ON SALT AND DRAGOON CREEKS.

TABLE 5.2—WATER-RESOURCES STATIONS IN THE PROPOSED SSC SITE WITH DRAINAGE AREA, PERIOD OF RECORD, AND MEAN AND EXTREME RECORDS FOR DISCHARGE OR VOLUME.

Station	Location	Drainage Area	Period of Record	Means and Extremes		
				Mean	Maximum	Minimum
Dragoon Creek	near Burlingame	114 sq. miles	1961-1985	69 cfs	34,400 cfs	0 cfs
Salt Creek	near Lyndon	111 sq. miles	1940-1985	62 cfs	36,400 cfs	0 cfs
110 Mile Creek	below Pomona	322 sq. miles	1940-1985	178 cfs	38,600 cfs	0 cfs
Pomona Lake	at damsite	322 sq. miles	1965-1986	66,640* acre-feet	149,500 acre-feet	54,260 acre-feet

* Storage at conservation pool

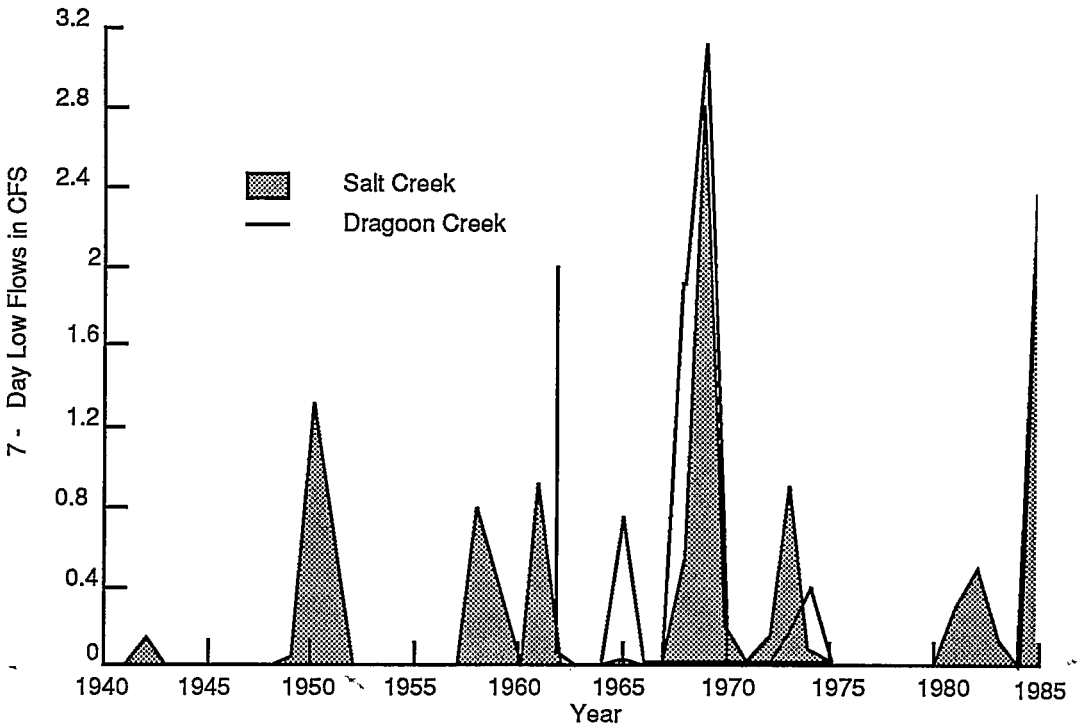


FIGURE 5.2—LOWEST ANNUAL SEVEN-DAY AVERAGE FLOW ON SALT AND DRAGOON CREEKS.

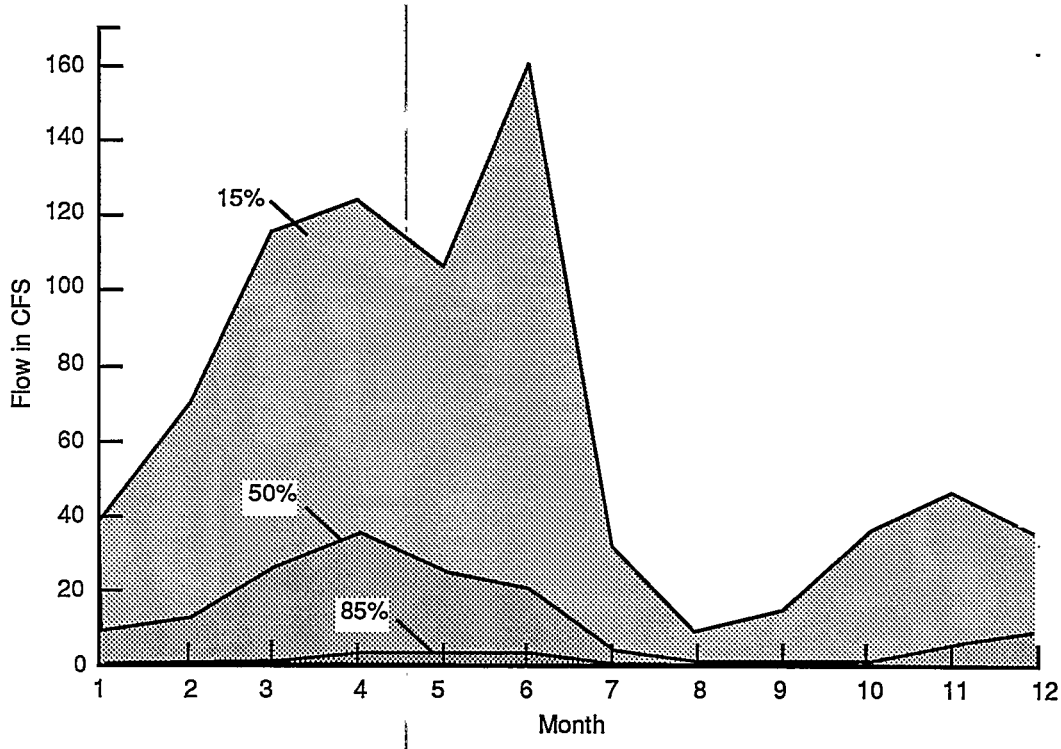


FIGURE 5.3—MONTHLY FLOWS OF INDICATED DURATION IN DRAGOON CREEK, 1961-1985.

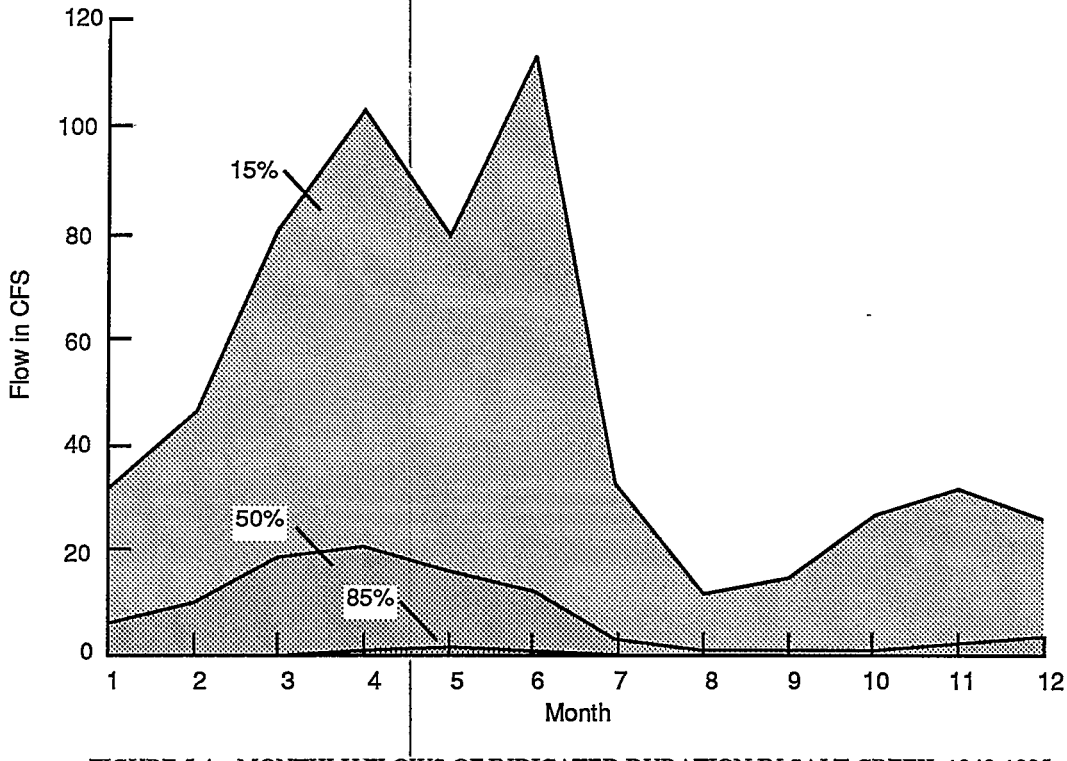


FIGURE 5.4—MONTHLY FLOWS OF INDICATED DURATION IN SALT CREEK, 1940-1985.

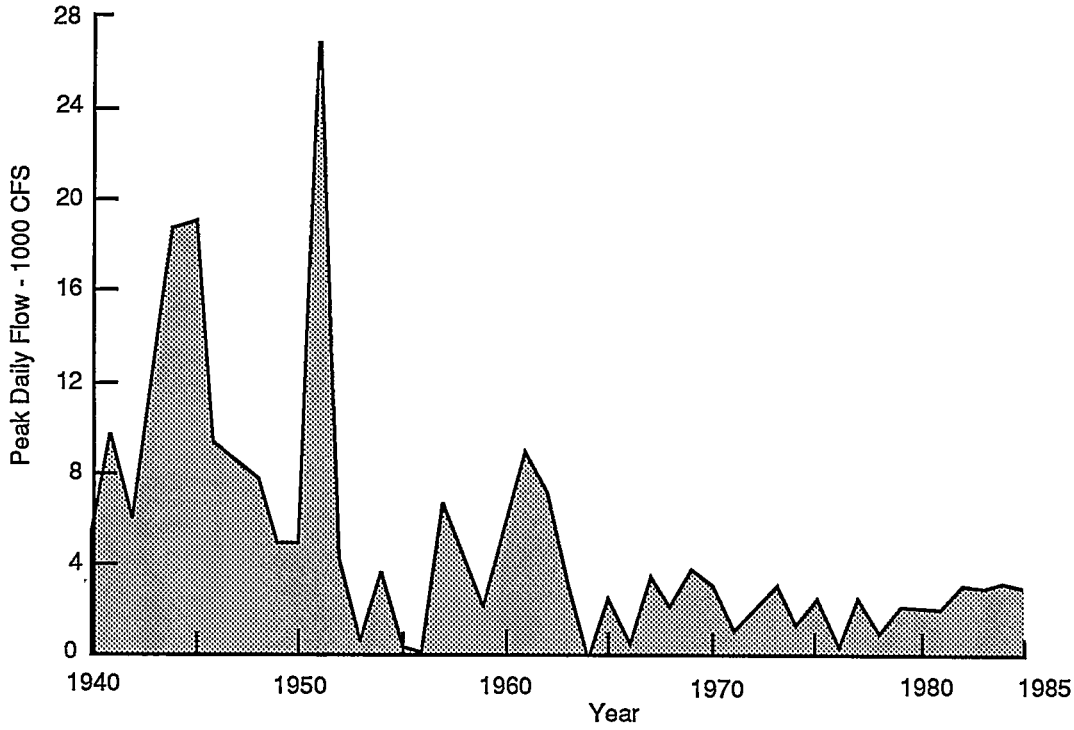


FIGURE 5.5—ANNUAL PEAK DAILY FLOW IN HUNDRED AND TEN MILE CREEK.

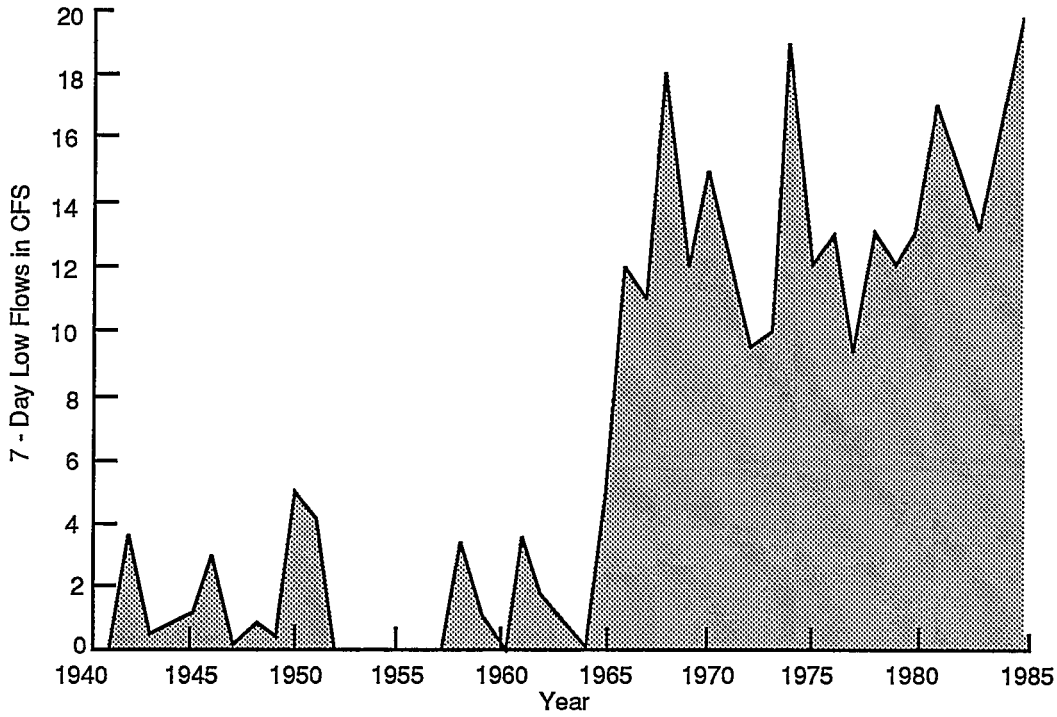


FIGURE 5.6—LOWEST ANNUAL SEVEN-DAY AVERAGE FLOW IN HUNDRED AND TEN MILE CREEK.

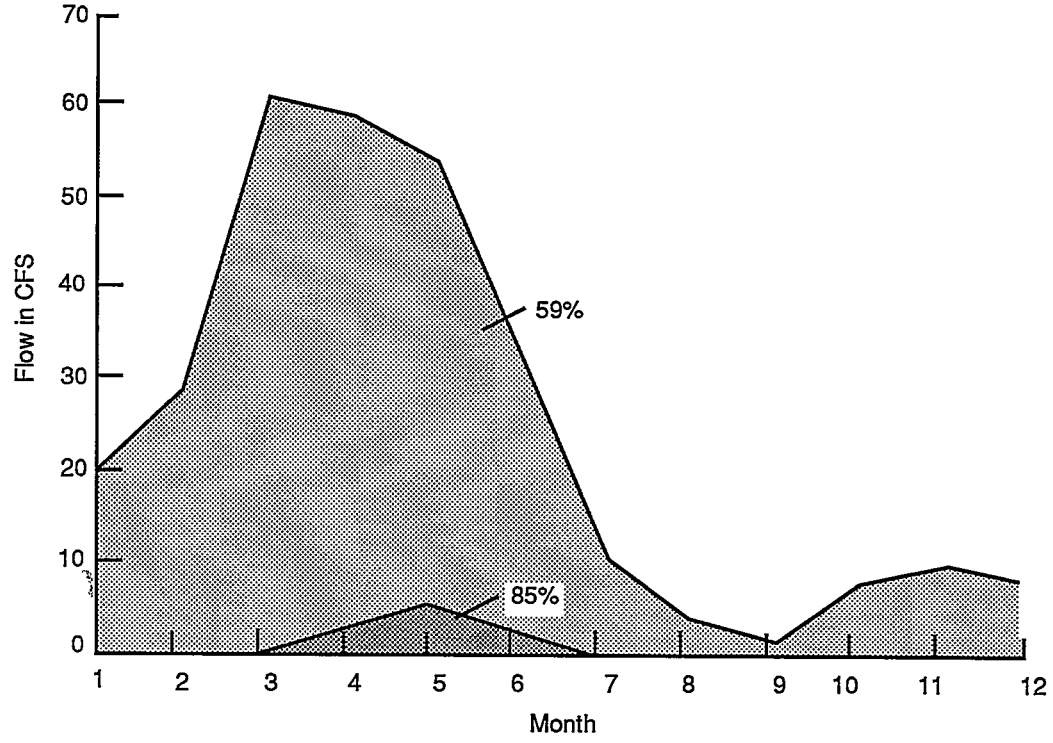


FIGURE 5.7—MONTHLY FLOWS OF INDICATED DURATION IN HUNDRED AND TEN MILE CREEK, 1940-1963, BEFORE IMPOUNDMENT BY POMONA LAKE.

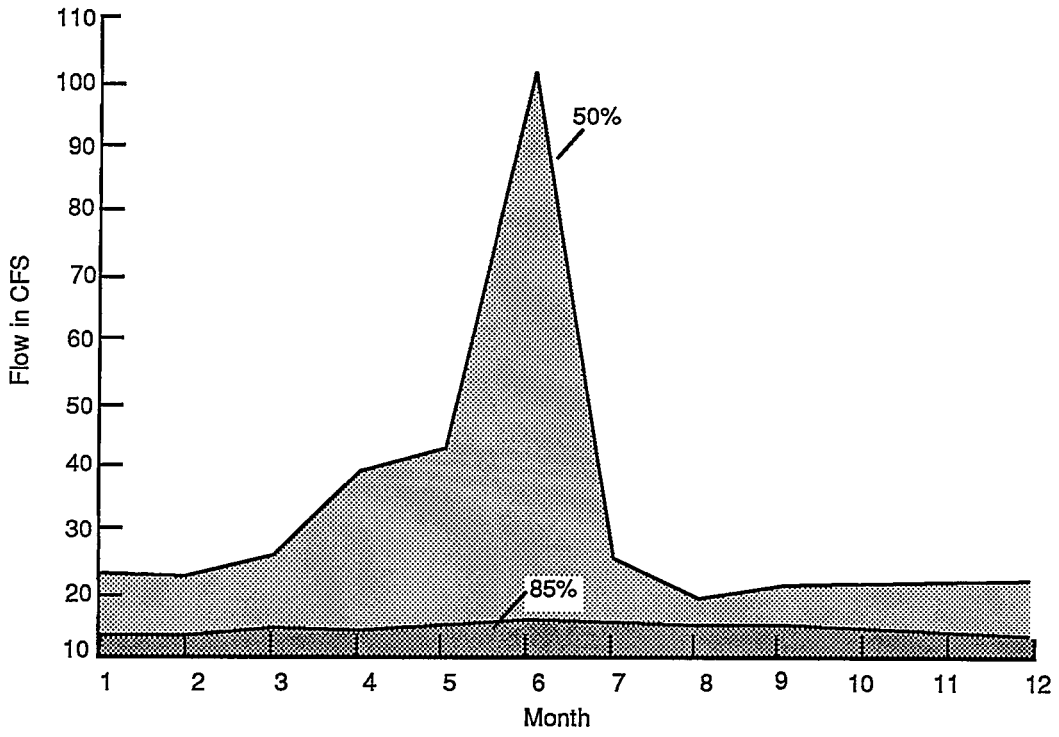


FIGURE 5.8—MONTHLY FLOWS OF INDICATED DURATION IN HUNDRED AND TEN MILE CREEK, 1965-1985, AFTER IMPOUNDMENT BY POMONA LAKE.

Pomona Lake stores 66,600 acre-feet of water in its conservation pool, which normally is at elevation 974 feet mean sea level (msl). Flood-control storage can hold an additional 170,000 acre-feet up to elevation 1,003 feet msl. The average pool elevation has been 974.48 feet msl, indicating consistent use of the flood-control storage capacity. Besides flood control, the major use of Pomona Lake has been fish and wildlife support, recreation, and low-flow supplementation. Only 500 acre-feet of water are currently used for water supply. Thus, drawdown of the conservation pool has not been extensive. Pool elevations have ranged from 990.24 feet msl to 969.60 feet msl (Figure 5.9).

5.2.3 Quality

The rural nature of the proposed SSC site is responsible for the good water quality in the lakes and streams of the area in that they are uncontaminated by municipal and industrial effluents. Typically, these bodies of water have moderate levels of hardness, buffering capacity, and conductivity and are slightly alkaline. Concentrations of metals are limited to background levels, which are a function of mineral composition of the rocks and soils in the region. The relatively old geologic age of the area combined with extensive amounts of agricultural activity sometimes results in high levels of nonfilterable residue (suspended solids) and turbidity in these waters. Agricultural activity also contributes nutrients from fertilizers and pesticides to the runoff. As a result, the four major lakes in this area are considered eutrophic, and herbicides, particularly atrazine, are commonly detected in trace amounts. However, water quality is still adequate to fully support, with one exception, the uses which are currently designated for these lakes (Table 5.3) given current water-quality standards (Table 5.4).

Water-quality data from streams around the proposed SSC site are available for Hundred and Ten Mile Creek just below Pomona Lake and for Dragoon Creek above Pomona Lake near Burlingame. The Hundred and Ten Mile Creek station is part of the water-quality-monitoring network operated by the Kansas Department of Health and Environment (KDHE). Water samples from this station are collected at approximately monthly intervals and analyzed for a variety of constituents. The Dragoon Creek location is a gauging station operated by the U.S. Geological Survey. Water samples are collected from this site at irregular intervals and analyzed for conductivity, pH, and nonfilterable residue.

From 1982 to 1985, conductivity in Dragoon Creek ranged from 222 to 730 µmhos/cm with a mean of 488 µmhos/cm. The range and mean for pH were 6.7 to 8.8 and 8.0, respectively. Nonfilterable residue concentrations ranged from 32 to 4,480 mg/L with a mean of 371

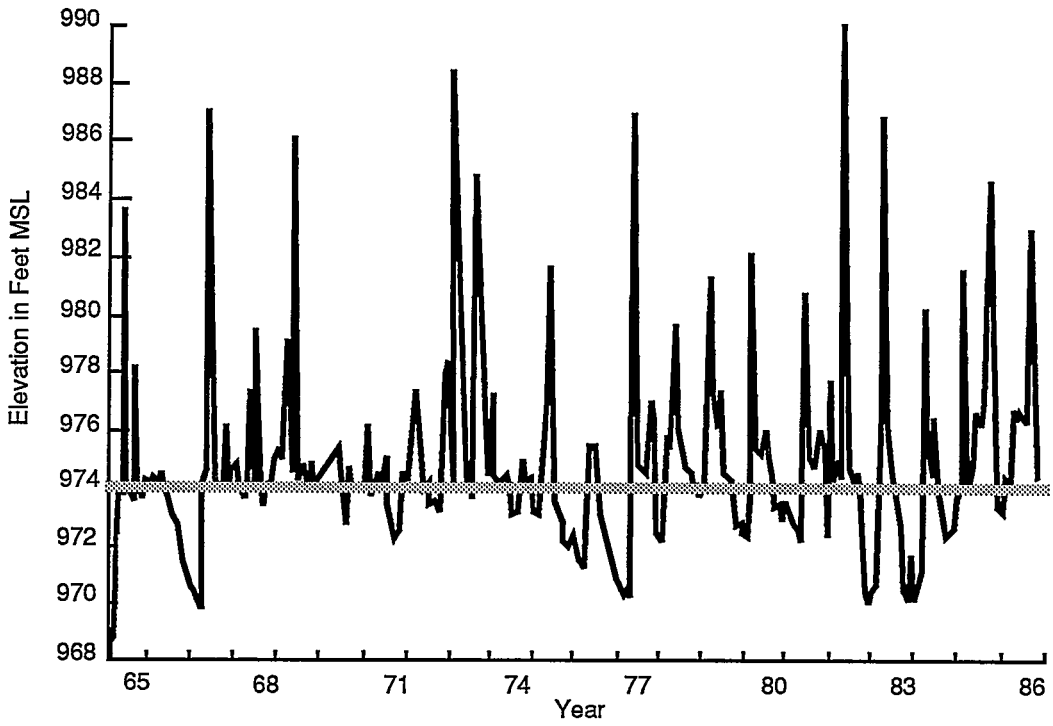


FIGURE 5.9—MONTHLY POOL ELEVATIONS OF POMONA LAKE, 1965-1986.

mg/L. The median nonfilterable residue concentration was 55 mg/L, indicating that the mean is biased by a few very high concentrations associated with storm-runoff events. Conductivity is typically highest in winter while pH and nonfilterable residue have peak levels in spring (Table 5.5). Although data are not available, Salt Creek and Hundred and Ten Mile Creek above Pomona Lake can be expected to have similar water quality because of the similarities in geology, geography, climate, and land use.

Below Pomona Lake in Hundred and Ten Mile Creek, conductivity and the concentration of nonfilterable residue were usually lower than above the lake. While pH was roughly the same (Table 5.6), the changes that occurred reflect processes which occur in the lake such as physical settling of suspended solids and production of phytoplankton. Seasonal changes in precipitation and agricultural activity also appeared to affect water quality in Hundred and Ten Mile Creek. The following parameters had distinctly higher concentrations in spring and summer: total and nonfilterable residue, total inorganic nitrogen, turbidity, iron, atrazine, alachlor, fecal streptococcus, and fecal coliforms (Table 5.6).

Data on lakes at the proposed site were available from several sources. Data from Pomona Lake and Osage County State Fishing Lake were generated by KDHE. Pomona Lake was sampled occasionally during the warm season from 1976 through 1980. Water-quality parameters in OCSFL were measured once in April 1981. Data for Strowbridge Reservoir and Lyndon City Lake have been periodically collected by the U.S. Geological Survey. In addition, temperature, oxygen, and alkalinity data have been collected on an irregular basis by the Kansas Fish and Game Commission for OCSFL and Strowbridge Reservoir.

Some of the differences in water quality that were evident between streams above and below Pomona Lake were also manifest within the lake itself. Water in the main basin of the lake had lower concentrations of residues, iron, and dissolved oxygen (Table 5.7) than water upstream in the Dragoon Creek arm. Otherwise, water quality in the streams and Pomona Lake were similar. Data on the vertical variation in temperature and oxygen did not indicate the presence of strong thermal stratification in Pomona Lake. This was caused by the lake's large surface area, relatively shallow average depth, and high average wind speeds which are usually sufficient to keep the lake well mixed.

The smaller lakes within the SSC site had water quality similar to Pomona Lake, except that in the smaller lakes, turbidity was slightly greater (Table 5.8) and thermal stratification existed in summer. During this period, dissolved oxygen concentrations in the hypolimnetic waters were greatly reduced or undetectable. The depth at which stratification took place in these lakes was about two-thirds of the maximum depth. Thus, the proportions of the lakes' volumes which had undesirably low dissolved oxygen concentrations were small.

TABLE 5.3—CATEGORIES OF USE AND LEVEL OF SUPPORT OF DESIGNATED USE, BASED ON EXCEEDANCES OF WATER-QUALITY STANDARDS FOR LAKES AND STREAMS IN THE SSC SITE. F = full support, P = partial support, U = unknown, NA = not an applicable use catagory. From: "Water Quality Assessment Report, Kansas Water Quality 1984-86, Appendices," Kansas Department of Health and Environment.

Place	Recreation		Aquatic Life Support	Drinking Water	Irrigation	Livestock Watering
	Contact	Noncontact				
110 Mile Creek below Pomona Lake	NA	F	F	F	F	F
Strowbridge Reservoir	NA	F	F	F	NA	NA
Pomona Lake	F	F	F	F	NA	NA
Osage County State Fishing Lake	NA	F	F	NA	NA	NA
Lyndon City Lake	NA	U	F	P	NA	NA

TABLE 5.4—WATER-QUALITY STANDARDS FOR VARIOUS WATER USES FROM K.A.R. 28-16-28e. — = standards not available or applicable. Units for coliforms are colonies/100 mL, units for radioactive parameters are pCi/L, all others are mg/L.

Parameter	Domestic Contact Recreation	Aquatic Life	Water Supply	Irrigation	Livestock
Ammonia (un-ionized as N)	—	0.07	—	—	—
Boron	—	—	—	0.75	5
Chloride	—	—	250	—	—
Dissolved oxygen	—	5.0	—	—	—
Fluoride	—	—	1.8	1	2
Nitrate (as N)	—	—	10	—	100
Sulfate	—	—	250	—	—
Total dissolved solids	—	500	—	—	—
Total residual chlorine	—	not detectable	—	—	—
Arsenic	—	—	0.05	0.1	0.2
Barium	—	—	1.0	—	—
Cadmium	—	—	0.01	0.05	0.01
Chromium (VI)	—	—	0.05	0.1	1.0
Copper	—	—	—	0.2	0.5
Lead	—	—	0.05	5.0	0.1
Mercury	—	—	0.02	—	—
Nickel	—	variable[1]	—	—	—
Selenium	—	0.035	0.01	0.2	—
Silver	—	0.0012	0.05	0.2	0.05
Zinc	—	0.047	0.002	2.0	25.0
Aldrin	—	0.0003	—	—	—
Chlordane	—	0.002	—	—	—
DDT	—	0.001	—	—	—
Dieldrin	—	1.9	—	—	—
Endosulfan	—	0.056	—	—	—
Endrin	—	0.0023	—	—	—
Heptachlor	—	0.0068	—	—	—
Lindane	—	0.08	—	—	—
Methoxychlor	—	0.03	—	—	—
Parathion	—	0.04	—	—	—
PCB's	—	0.014	—	—	—
Toxaphene	—	0.013	—	—	—
Gross alpha[2]	—	—	150	—	—
Radium 226+228	—	—	5	—	—
Strontium 90	—	—	8	—	—
Tritium	—	—	2000	—	—
Gross beta	—	—	50	—	—
Maximum fecal coliform	400	—	—	—	—
Average fecal coliform	200	—	—	—	—

[1]Ranges from 0.056 to 0.324 mg/L and is proportional to hardness.
[2]Includes radium 226; but not radon or uranium.

TABLE 5.5—SUMMARY OF WATER-QUALITY DATA FROM DRAGOON CREEK NEAR BURLINGAME. Data are from 1982 to 1985. n = number of observations. Source: U.S. Geological Survey.

	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec
	Conductivity (μ mhos/cm)			
Mean	528	459	464	514
Minimum	296	174	330	307
Maximum	730	651	540	682
n	6	6	7	4
	pH			
Mean	7.9	8.3	7.8	7.9
Minimum	7.4	7.7	6.7	7.9
Maximum	8.2	8.8	8.2	7.9
n	6	5	8	3
	Nonfilterable Residue (mg/L)			
Mean	106	969	43	57
Minimum	32	42	32	57
Maximum	215	4480	55	57
n	6	7	6	2

5.2.4 Flood Areas

Plate 5.2 (in back envelope) indicates the extent of land which would be inundated by a 100-year flood event. The streams which have the most flood area are Dragoon Creek, Salt Creek, and a portion of Hundred and Ten Mile Creek upstream from the Marais des Cygnes River. Very little flooding would likely occur above Strowbridge Reservoir in the proposed campus area. Access and service areas E-9 and F-6 would fall within the floodplain if kept in their originally proposed locations. However, moving their locations only several hundred feet would remove them from the floodplain.

TABLE 5.6—SUMMARY OF WATER-QUALITY DATA FROM HUNDRED AND TEN MILE CREEK BELOW POMONA LAKE. Means are based on approximately monthly sampling from 1977 through 1986. Seasonal means are averages over three-month intervals: winter = January, February, and March; spring = April, May, and June; etc. ND = not detected; NA = not analyzed. Not all of the listed parameters were measured at each sampling time. Source: Kansas Department of Health and Environment.

	Annual Means			Seasonal Means			
Parameter	Minimum	Mean	Maximum	Winter	Spring	Summer	Fall
Inorganic nitrogen (mg/L as N)	0.54	0.76	0.92	0.73	0.97	0.82	0.56
Total phosphorus (mg/L as P)	0.07	0.13	0.20	0.07	0.13	0.16	0.13
pH	7.8	7.9	8.0	8.0	7.9	7.7	7.8
Residue, total (mg/L)	236	277	468	222	377	277	266
Residue, nonfilterable (mg/L)	28	70	277	14	171	81	28
Dissolved oxygen (mg/L)	9.5	10.2	11.2	13.2	9.5	7.5	10.6
Alkalinity, total (mg/L as $CaCO_3$)	111	127	139	143	124	118	126
Temperature (°F)	52	56	60	36	59	75	10.6
Turbidity (NTU)	20	42	51	12	77	60	23
Conductivity (µmhos/cm)	300	336	370	383	326	312	321
Calcium (mg/L)	44	49	56	55	49	46	47
Magnesium (mg/L)	7.9	8.8	10	10	8.6	9.6	8.5
Sodium (mg/L)	8.7	11	12	12	11	9.6	10
Chloride (mg/L)	5.4	8.1	11	9.0	8.4	7.1	7.5
Sulfate (mg/L as SO_4)	35	41	47	45	43	39	37
Iron, diss. (µg/L)	9.5	428	1720	180	431	360	140
Manganese, diss. (µg/L)	10	208	1090	40	387	25	10
Boron, total (µg/L)	25	77	155	80	80	67	98
Barium, total (µg/L)	ND	118	510	100	287	NA	NA
Lead, total (µ/L)	ND	18	100	10	20	50	ND
Zinc, total (µg/L)	ND	116	870	40	335	5.0	10
Cadmium, total (µ/L)	ND	0.70	2.0	1.0	3.4	ND	ND
Mercury, total (µg/L)	ND	0.06	0.50	ND	ND	ND	ND
Atrazine, total (µg/L)	1.50	2.92	4.75	0.85	1.70	5.26	4.20
Alachlor, total (µg/L)	0.47	0.47	0.48	ND	ND	0.49	ND
Fecal coliform (per 100 ml)	64	1153	8374	32	975	232	296
Fecal strep (per 100 ml)	147	1669	6529	120	4255	467	955

TABLE 5.7—WATER-QUALITY DATA FROM SURFACE WATERS OF POMONA LAKE. U = upstream in Dragoon Creek arm; D = downstream near the dam; ND = not detected; NA = not analyzed. Source: Kansas Department of Health and Environment.

Parameter	May 1976		August 1978		July 1978		August 1980	
	U	D	U	D	U	D	U	D
Inorganic nitrogen (mg/L as N)	0.67	0.40	0.38	0.22	0.39	0.49	0.51	0.62
Total phosphorus (mg/L as P)	NA	NA	0.17	0.14	0.015	0.022	0.070	0.030
pH	8.0	8.1	NA	7.7	8.1	8.5	8.1	7.8
Residue, total (mg/L)	NA	NA	NA	NA	NA	NA	NA	NA
Residue, nonfilterable (mg/L)	20	4	36	22	82	10	44	19
Dissolved oxygen (mg/L)	9.4	9.0	8.2	6.0	8.2	NA	5.8	4.9
Alkalinity, total (mg/L as $CaCO_3$)	143	150	120	104	134	170	124	136
Temperature (°F)	65	63	77	77	NA	NA	78	79
Turbidity (NTU)	9	35	13	15	13	5	29	14
Conductivity (µmhos/cm)	375	275	270	270	330	325	340	400
Calcium (mg/L)	55	56	NA	NA	NA	NA	43	42
Magnesium (mg/L)	9.3	8.6	NA	NA	NA	NA	9.8	9.8
Sodium (mg/L)	13	13	8.4	8.5	11	10	11	10
Chloride (mg/L)	NA	6	12	12	8	13	6	5
Sulfate (mg/L as SO_4)	NA	NA	30	30	34	37	43	36
Iron, diss. (µg/L)	620	320	1700	710	2000	580	1600	720
Manganese, diss. (µg/L)	10	10	80	30	250	100	90	120
Boron, total (µg/L)	90	150	NA	NA	100	50	ND	30
Barium, total (µg/L)	NA	NA	NA	NA	NA	NA	ND	ND
Lead, total (µg/L)	NA	ND	NA	ND	ND	ND	NA	ND
Zinc, total (µg/L)	NA	ND	NA	10	10	10	NA	20
Cadmium, total (µg/L)	NA	ND	NA	ND	ND	ND	NA	ND
Mercury, total (µg/L)	NA	ND	NA	NA	NA	NA	NA	ND
Atrazine, total (µg/L)	NA	NA	NA	NA	NA	NA	NA	2.6
Alachlor, total (µg/L)	NA	NA	NA	NA	NA	NA	NA	ND
Fecal coliform (per 100 ml)	NA	10	100	100	100	60	100	10
Fecal strep (per 100 ml)	NA	10	100	100	500	10	100	10

TABLE 5.8—SUMMARY OF WATER-QUALITY DATA FOR LYNDON CITY LAKE, OSAGE COUNTY STATE FISHING LAKE, AND STROWBRIDGE RESERVOIR. Data for Lyndon City Lake and Strowbridge Reservoir were taken over the period from April 1983 to March 1986. Within that period, samples were taken between the months of March and October; however, not every parameter was measured at each sampling time. Data for Osage County State Fishing Lake (OCSFL) were taken on 27 April 1981. ND = not detected; NA = not analyzed; * = only two samples for this parameter; ** = ammonia only, NO_2 and NO_3 not analyzed. Sources: Kansas Department of Health and Environment and U.S. Geological Survey.

	Lyndon City Lake			OCSFL	Strowbridge Reservoir		
Parameters	Minimum	Mean	Maximum		Minimum	Mean	Maximum
Inorganic nitrogen (mg/L as N)	.02	.16	.40	.02**	.01	.57	1.29
Total phosphorus (mg/L as P)	.01	.04	.12	.02	.01	.07	.29
pH	8.0	8.4	8.6	8.2	7.0	8.0	8.8
Residue, total (mg/L)	NA	NA	NA	NA	164	178	200
Residue, nonfilterable (mg/L)	NA	NA	NA	NA	4	12	20
Dissolved oxygen (mg/L)	7.4	9.0	10.0	NA	5.2	8.1	11.1
Alkalinity, total (mg/L as $CaCO_3$)	NA	NA	NA	136	NA	NA	NA
Temperature (°F)	51.8	64.6	82.4	63	50.0	68.5	81.5
Turbidity (NTU)	10	22	44	22	6	32	74
Conductivity (µmhos/cm)	220	266	305	275	200	299	340
Calcium (mg/L)	NA	NA	NA	NA	36	40	42
Magnesium (mg/L)	NA	NA	NA	NA	7.0	8.0	8.2
Sodium (mg/L)	NA	NA	NA	12	9.1	9.5	10.0
Chloride (mg/L)	NA	NA	NA	NA	NA	NA	NA
Sulfate (mg/L as SO_4)	NA	NA	NA	35	28	32	34
Iron, diss. (µg/L)	120	480	1200	190	130	458	880
Manganese, diss. (µg/L)	20	78	200	50	30	67	210
Boron, total (µg/L)	NA	NA	NA	NA	NA	NA	NA
Barium, total (µg/L)	NA	NA	NA	NA	NA	NA	NA
Lead, total (µg/L)	NA	NA	NA	NA	NA	NA	NA
Zinc, total (µg/L)	NA	NA	NA	NA	NA	NA	NA
Cadmium, total (µ/L)	NA	NA	NA	NA	NA	NA	NA
Mercury, total (µg/L)	ND	NA	NA	NA	NA	NA	NA
Atrazine, total (µg/L)	ND	ND*	ND	ND	ND	2.5*	2.5
Alachlor, total (µg/L)	ND	.63*	.63	ND	ND	ND*	ND
Fecal coliform (per 100 ml)	NA	NA	NA	10	NA	NA	NA
Fecal strep (per 100 ml)	NA	NA	NA	10	NA	NA	NA

5.3 FISH AND WILDLIFE

5.3.1 Fish and Wildlife Resources

The major portion of the project area lies in Osage County, Kansas. The following numbers of species by taxonomic class have been documented in Osage County: fishes, 36; amphibians, 10; reptiles, 35; birds, 285; mammals, 37. Complete listings of species for each group are available.

Principal game fishes that occur in streams in the project area are channel catfish (*Ictalurus punctatus*) and flathead catfish (*Pylodictis olivaris*). Additionally, white crappie, (*Proxomis annularis*), walleye (*Stizostedion vitreum*), and white bass (*Morone chrysops*) are taken in project-area streams due to their movement out of reservoirs. Surveys of Dragoon, Hundred and Ten Mile, and Salt creeks conducted in the late 1970's found large variations among sites in the number of fish species present (Brunson,1980). A maximum of 23 species were found at a site on Dragoon Creek below the confluence of Switzler Creek. The minimum number found was two in Hundred and Ten Mile Creek between Dragoon Creek and the Marais des Cygnes River.

Three of the impoundments within the project area have public fisheries. Osage State County Fishing Lake has good-quality largemouth bass (*Micropterus salmoides*) and walleye populations. This is a heavily fished lake with most pressure being directed towards crappie and channel catfish. Channel catfish are maintained through a put-grow-and-take program. White crappie are self recruiting, although they exhibit poor growth. Other species in this lake include redear sunfish (*Lepomis microlophus*), bluegill (*Lepomis macrochirus*), gizzard shad (*Dorosoma cepedianum*), and various rough fish species. The fishery in Strowbridge Reservoir is typified by a moderate largemouth bass population both in terms of numbers and quality. The white crappie population is good, although the bluegill population has declined since the appearance of gizzard shad in recent years. Other species which occur are the channel catfish, walleye, white bass, and rough fish species. In Pomona Lake, the major sport fishes are walleye, white crappie, channel catfish, flathead catfish, white bass, and wipers (strip bass/white bass hybrids). This reservoir is fished on a moderate to heavy basis, and as a result each species has a strong angler following. In recent years white crappie and catfish populations have sustained high-quality fisheries and produced good fishing. White crappie, for example, are taken in Dragoon Creek during spring migrations. The lake is currently part of a statewide crappie study.

Amphibians within the project area include three salamander species, two toads, and five frog species. Bullfrogs (*Rana catesberana*) are harvested for sport and human consumption.

The reptile group includes nine species of turtles including common species such as the common snapping turtle (*Chelydra s. serpentina*) and the ornate box turtle (*Terrapene o. oranta*). Six lizard species occur in the project area. Twenty species of snakes have been found in the project area. Venomous species are the massasauga (*Sistrus catenatus*), timber rattlesnake (*Crotalus horridus*), and the copperhead (*Agkistrodon contortix*).

Bird species within the project area outnumber the species of all other classes of vertebrates combined. Various waterfowl species and shorebirds utilize water bodies during spring and fall migrations. Important upland game species include the greater prairie chicken (*Tympanuchus cupido*) and the northern bobwhite quail (*Colinus virginanus*). A low-density population of ring-necked pheasant (*Phasianus colchicus*) also exists. Due to recent re-introductory efforts, wild turkeys (*Meleagris gallopavo*) also occur in harvestable numbers. Many passerine species adapted to grasslands and woodlands occur in suitable habitat.

Thirty-seven species of mammals occur within the project area. Rodents are represented by the western harvest mouse (*Reithrodontomys megalotis*), deer mouse (*Peromyscus maniculatus*), and hispid cotton rat (*Sigmodon hispidus*) among others. Three species of canids occur with the coyote (*Canis latrans*) being most common. A number of furbearers occur in the area with raccoons being the predominant harvestable species. Osage County also ranks among the top counties in Kansas for numbers of bobcats harvested. Other furbearers taken include opossum, skunk, muskrat, mink, and beaver. The value of pelts harvested from Osage County in 1986 was estimated to be $36,000. The only big-game mammal in the area is the white-tailed deer (*Odocoilus viginianus*). In 1985, 67 deer were harvested in Osage County by archers and 317 were taken by firearms. An additional 27 deer mortalities occurred from vehicular accidents.

5.3.2 Threatened or Endangered Species

A total of 12 state-listed threatened and endangered species are known or likely to occur within the project area. Six of the 12 are Federally listed. However, neither state or federal agencies have designated any critical habitat within the project area for any of the

species. Endangered species are the bald eagle (*Haliaeetus leucocephalus*), eskimo curlew (*Numenius borealis*), least tern (*Sterna antillarum*), peregrine falcon (*Falco peregrinus*), and the whooping crane (*Grus americana*). Threatened species are the eastern hognose snake (*Heterodon platyrhinos*), eastern spotted skunk (*Spilogale putoris interrupta*), hornyhead chub (*Nocomis bigguttatus*), northern crawfish frog (*Rana areolata circulosa*), piping plover (*Charadrius melodus*), snowy plover (*Charadrius alexandrinus*), and the white-faced ibis (*Plegadis chihi*). Of the threatened species, only the plovers have been documented to occur in the area; however, the area is within the known range of the other threatened species.

5.4 VEGETATION

5.4.1 Description

The proposed SSC site lies in an area dominated by bluestem prairie, one component of the Tallgrass Prairie of North America. The terrain of rolling hills was once blanketed by prairies composed mainly of big bluestem (*Andropogon gerardii*) on the uplands and cordgrass (*Spartina pectinata*), fall panicum (*Panicum dichotomiflorum*), eastern gamagrass (*Tripsacum dactyloides*), and rusty bulrush (*Scripus pendulus*) in the lowlands. Forested areas were restricted to areas bordering primary waterways and were composed of burr oak (*Quercus macrocarpa*) and green ash (*Fraxinus pennsylvanica*) on the sloped and well-drained bottoms and mostly cottonwood (*Populus deltoides*) in the lowest sites. The total flora of the area included some 700 species of woody plants, forbs, and grasses. Plate 5.3 (in back envelope) illustrates the potential natural vegetation in the proposed SSC area.

Today this region has been largely converted to modified pastureland, row-crop cultivation, and woodlots. Detailed current land use for the near and far cluster areas is presented in Plate 5.4 (in back envelope). While the total number of plant species occurring here has not diminished, native vegetation is restricted to small parcels of land scattered on the landscape.

5.4.2 Threatened and Endangered Species

Kansas currently has no laws regarding plant protection and thus follows the guidelines of the Endangered Species Act of 1973, administered by the U. S. Fish and Wildlife Service. No plant species occurring in Kansas are currently listed by the Service. Eight species, however, are proposed for listing and should for now be treated as though listed. Three are known to occur in or close to the proposed SSC site: prairie white-fringed orchid (*Platanthera leucophaea*, incld. *P. praeclara*), Mead's milkweed (*Asclepias meadii*), and foxglove (*Tomanthera auriculata*).

5.5 AIR QUALITY

5.5.1 Existing Air Quality and Air-quality Limitations

The Kansas Department of Health and Environment coordinates a network of 31 air-monitoring stations located in urban areas throughout the state. The network measures the concentrations of six criteria pollutants: total suspended particulates, lead, sulfur dioxide, ozone, carbon monoxide, and nitrogen dioxide. Usually, each station measures only one pollutant. Even though measured in urban areas, pollutant levels in the region of the SSC are in compliance with National Ambient Air Quality Standards. Automobile emissions are the primary atmospheric source of nitrogen dioxide and volatile organic compounds (which are both precursors of ozone), carbon monoxide, and lead. Power plants and industrial facilities discharge significant amounts of particulates, sulfur dioxide, and carbon monoxide. Since these pollution sources are lacking near the proposed SSC site, lower levels of these pollutants can be expected at the proposed site than at the monitoring stations given in Table 5.9. A possible exception may be the total suspended particulates (TSP). The high intensity of agricultural activity and the abundance of unpaved roads near the SSC site are conditions which can lead to locally high concentrations of TSP.

Much of the TSP measured in Kansas may be accounted for by natural sources considering the state's semi-arid soil conditions and high average wind speeds (section 7.3.3). In fact, the highest TSP level in 1985 occurred on May 31, the same day that relatively high levels were measured at 14 other stations in Kansas and in neighboring states, suggesting a meteorological phenomenon common throughout the Midwest (Kansas Department of Health and Environment, 1986). These same winds and the open prairie location of the site endow it with high dispersion conditions which dilute and carry away most point-source air pollutants and make the formation of inversion conditions, where pollutants are confined in one location, virtually impossible (Holzworth, 1972).

Considering 1) that even the highest levels of pollutants in urban areas nearest the site are below prescribed standards; 2) that air quality will be generally better at the proposed SSC site than in the urban areas; and 3) that any resulting air pollution will be quickly dispersed, no air-quality limitations exist for placement of the SSC at the proposed site.

TABLE 5.9—MEANS AND MAXIMUM FOR AIR-QUALITY PARAMETERS FROM KANSAS DEPARTMENT OF HEALTH AND ENVIRONMENT SAMPLING STATIONS NEAREST THE PROPOSED SSC SITE. The values in parentheses are the appropriate primary National Ambient Air Quality Standard. Nitrogen dioxide data were from the period September 1986 through December 1986; all other data are for 1985.

Pollutant	Sampling Location	1985 Maximum	1985 Mean
Total suspended particulates ($\mu g/m^3$)	Topeka	221(260)[a]	51(75)
Lead ($\mu g/m^3$)	Topeka	0.12(1.5)[b]	0.08
Sulfur dioxide ($\mu g/m^3$)	Kansas City	104(365)[a]	26(80)
Ozone ($\mu g/m^3$)	Kansas City	229(235)[c]	45
Carbon monoxide (mg/m^3)	Kansas City	9.9(40)	1.7
Carbon monoxide (mg/m^3)	Kansas City	7.3(10)[d]	—
Nitrogen dioxide ($\mu g/m^3$)	Kansas City	260	62(100

[a] 24-hour average [b] 3-month average [c] 1-hour average [d] 8-hour average

5.6 BACKGROUND RADIATION

5.6.1 Soil/rock and Ground-water Background Radioactivity

Background radiation data for soils have been collected by the Kansas Department of Health and Environment (KDHE) as part of pre-operational monitoring of the Wolf Creek Generating Station (WCGS). This nuclear power plant is located about 30 miles south of the proposed SSC site in terrain which is geologically and geographically similar to the SSC site. Fifteen samples were collected between September 1983 and May 1985 from 14 different locations. Thirteen samples were analyzed for strontium 89 and 90. For strontium 89, six samples had no detectable activity (<0.2 pCi/g). The seven other samples had a mean activity of 0.5 pCi/g. The maximum activity was 0.9 pCi/g. For strontium 90, seven samples had no detectable activity. The remainder had a mean and maximum activity of 0.6 and 1.6 pCi/g, respectively. Three of the 15 samples were also analyzed for cesium 137 and were found to have mean and maximum activities of 1.0 and 2.0 pCi/g, respectively.

Five shallow water wells from around WCGS have been monitored for background radiation in ground water. Each well was sampled quarterly between August 1983 and May 1985 and analyzed for gross alpha, gross beta, tritium, and gamma activity. For gross alpha activity, the average for all stations was 3.6 pCi/L and the maximum observation was 22.0 pCi/L. The average gross alpha activities of each station over the sampling period ranged from 0.9 to 8.7 pCi/L. Gross beta activity averaged 3.5 pCi/L with a maximum of 9.3 pCi/L. The range of averages for the individual sampling locations was 1.4 to 5.5 pCi/L. Tritium activity was only detected in 33 percent of the samples with the highest activity being only 0.2 nCi/L. No detectable gamma activity was found in any ground-water samples.

Additional data on ground water exists for drinking-water wells in Overbrook, Quenemo, and Waverly, which were sampled between September 1978 and February 1982. Overbrook and Quenemo are within a few miles of the ring on the north and south sides, respectively, and Waverly is about 20 miles south of the proposed SSC site. Analyses from two wells in Overbrook found gross alpha activity of 2.5 and 10.0 pCi/L. The latter well also had a radium 226 activity of 2.0 pCi/L. Water from one well in Quenemo was analyzed twice and had gross alpha activities of 1.4 and 3.2 pCi/L. The well in Waverly contained water with gross alpha activity of 0.4 pCi/L. The activities reported for the wells from these small towns are within the range of activities for the wells from around the Wolf Creek Generating Station. All of the reported activities are well below the water-quality standards for domestic water supply (Table 5.4).

Although little data on specific radioactivity of rocks from the region of the proposed SSC site are available, two sources of background radiation are known to exist. Anomalous concentrations of uranium oxide, 170 ppm U_3O_8, have been found in the Heebner shale (Runnels et al., 1953). This black shale sometimes contains phosphate nodules. The nodules can be considerably enriched with up to 350 ppm U_3O_8 while the surrounding shale may contain up to 100 ppm U_3O_8 (Berendsen and Hathaway, 1977). The other source is radon gas which occurs as the uranium in the shales radioactively decays. In comparison to other states, the situation in Kansas

concerning radon is about average. The proposed location of the SSC in Kansas places parts of the ring in the thin Heebner shale mentioned above and several other thin black shales in units above it. Thus radon will possibly seep into the collider tunnels and other underground structures. Recent work at the Kansas Geological Survey (Berendsen, personal communication), estimates that the concentration of radon from the Heebner may be as much as 60 pCi/L. The collider tunnel will pass through the Heebner shale between shafts E1-F1 and E6-F6. It will occur in shafts E1, F1, E2, F2, E3, F3, E5, F5, and E6. It may occur also in collider halls near the west end of the south cluster. Adequate ventilation and moderate atmospheric over-pressure in the tunnel and other underground structures will reduce or stop infiltration, but this should be further investigated.

5.7 HISTORICAL AND ARCHEOLOGICAL RESOURCES

5.7.1 Description

Archeologically, the Osage Cuestas region of Kansas, in which the proposed SSC site is located, has yielded evidence of prehistoric human occupation dating from around 14,000 years ago and extending up to the modern era. The potential exists for yielding more such evidence. Sites in the region usually represent habitation areas or small workshops and more rarely occur as villages or burial mounds. While the full extent of the area's archeological resources have yet to be determined, it is clear that the region contains materials deriving from all of the major cultural periods thus far identified in Kansas:

Paleo-Indian	circa 20,000 B.C. to 6,000 B.C.
Archaic	circa 8,000 B.C. to A.D. 1
Early Ceramic	circa A.D. 1 to A.D. 1000
Middle Ceramic	circa A.D. 1000 to A.D. 1500
Late Ceramic	circa A.D. 1500 to A.D. 1800
Historic	A.D. 1541 to present

This list consists of broad and somewhat artificial categories, and some temporal overlap exists between periods. As might be expected, more is known about the most recent inhabitants than is known about the earliest.

No properties listed on the National Register of Historic Places are located within the proposed SSC site. A preliminary records search and sample survey of the area by archeologists and an architectural historian from the Kansas State Historical Society found five prehistoric and two historic archeological sites. The oldest prehistoric habitation site dates back to the Early Ceramic Period (A.D. 500-A.D. 1000). This site is located 2 miles west of Lyndon. Two sites dating back to the Middle Ceramic Period (A.D.1000-A.D. 1500) occur 3 miles west of Lyndon and 2 miles northwest of Quenemo. Two prehistoric sites of unknown date are located 3 miles west of Lyndon and 1 mile north of Scranton. The two historic sites, one an 1857 homestead and the other an 1869 railroad camp, are both located in the section north of Scranton.

Five barns and six farmsteads were determined to be potentially eligible for listing on the National Register. Two farmsteads are located 5 miles northeast of Overbrook and one is 2 miles west of Overbrook. Others can be found 3 miles northeast of Osage City, the south-central portion of the future expansion area, and the south portion of the campus. Two barns are located in the campus area and three barns are in the northwest injector area (Table 5.10 and Plate 5.3 [in back envelope]). The barns and farmsteads appear to be from the latter part of the nineteenth century.

The Santa Fe Trail passed through this region of Kansas. Government Land Office survey maps dated 1857 show the location of the trail west of the present-day town of Overbrook as a northern semi-circle following a ridgeline. The maps indicate that the route passed through the southern portion of the proposed future expansion and campus areas, then proceeded southwesterly out of project property. Remnants of the trails in the form of wagon ruts no longer exist in these areas. However, six parallel ruts, each approximately 6 to 8 feet wide and 1 foot deep and from 80 to 150 feet long, can be seen cutting through a low ridge south of U.S. Highway 56 and just north of the entrance to Osage County State Fishing Lake.

Fossilized amphibian foot prints have been found in limestone outcrops and quarries south of Osage City (Schoewe, 1956). The tracks were found in the Utopia limestone which is located considerably above the proposed location of the collider ring.

TABLE 5.10—BUILDINGS AND SITES WITHIN THE SSC PROJECT AREA POTENTIALLY ELIGIBLE FOR LISTING ON THE NATIONAL REGISTER OF HISTORIC PLACES. Sites and buildings are plotted on Plate 5.3 (in back envelope).

Sites	Map Reference No.	Cultural Affiliation
Archeological		
140515	1	Middle Ceramic, Pomona Focus
1405385	2	Middle Ceramic, Pomona Focus
1405386	3	Unknown
1405387	4	Euro-American
1405388	5	Euro-American
1405389	6	Early Ceramic, Greenwood Phase
1405390	7	Unknown
Historical		
McGrew Barn	8	Euro-American
Vowell Barn	9	Euro-American
D. Forbes Barn	10	Euro-American
J. Badger Barn	11	Euro-American
Kaff Barn	12	Euro-American
Kaff Farmstead	13	Euro-American
Goodyear Farmstead	14	Euro-American
Fenton Farmstead	15	Euro-American
Thompson Farmstead	16	Euro-American
Breithaupt Farmstead No. 1	17	Euro-American
Breithaupt Farmstead No. 2	18	Euro-American

5.8 PRELIMINARY ENVIRONMENTAL EVALUATION

5.8.1 Description of Impacts

Topographical Resources

The collider ring, energy boosters, and interaction halls would be located about 200 feet below ground and would be excavated by tunneling. Therefore, the impact of the SSC on topography would be limited to landscaping for the placement of surface buildings and the filling of strip mines and quarries. The overall impact of the surface construction on topography should be minor and concentrated at the campus area. The reclamation of strip mines and quarries may represent an aesthetic improvement.

Geological Resources

Fossil fuels in the form of oil, natural gas, and coal exist in the vicinity of the proposed SSC site. A new oil field is currently being developed near the town of Vassar, immediately south of Pomona Lake. At this time the amount of reserves are unknown, but the number of dry holes suggests that this is not a large field. The top of this oil deposit is about 1,700 feet below the surface, well below the deepest level proposed for the SSC. Therefore, the SSC would not have an impact on this resource. Natural-gas fields exist in the eastern portion of the SSC site. The tops of these deposits are located about 1,200 feet below the surface and, like the oil reserves, are too deep to be impacted by the collider ring. Several layers of coal, typically 1 to 2 feet thick, exist in the region of the SSC site. Mining of one of the shallow layers was important to the history of the immediate region. Vertical-access shafts would likely pass through at least one layer of coal, and coal may also be encountered by the collider ring. The amount of coal excavated by the tunneling would likely be insignificant compared to the total amount of spoils and should not create a disposal problem or represent an economic loss.

Soil Resources

The most important soil resource in this region is prime farmland as defined by soil type by the Soil Conservation Service. Of the approximately 8,000 acres of land which would be purchased as fee simple title and given to the U.S. government, about 3,420 acres would be prime farmland. Construction would permanently alter 1,340 acres of this land and 2,080 acres would potentially be idled, depending on how DOE wishes to manage this property. Of the prime farmland potentially impacted, about 3,055 acres are currently used for row crops.

Land Resources

Land purchased for the SSC would be potentially altered by construction, idling, or spoils disposal. Construction would impact 8 acres of native prairie, 237 acres of modified grassland, 12 acres of woodlots, and 462 acres of row crops (Table 5.11). A total of 6,470 acres currently used for grassland and row crop would potentially be idled by DOE (Table 5.12), and 608 acres of strip mines and quarries (Table 5.13) would be reclaimed using the method of spoils disposed proposed in section 3.5.5. Most of these acreage estimates are based on the template provided in the ISP. The amount of land actually purchased for the SSC will be slightly greater.

Water Resources

The impact of the SSC on water resources would be primarily on surface-water features. Lakes and streams at the proposed site could be affected by construction activities, contamination by waste discharges, changes in watershed usage after construction, or by dewatering to meet the operational needs of the facility.

Strowbridge Reservoir (SR) is the surface-water feature most likely to be impacted by the SSC because the major surface facility for the project, the campus area, would be located within several hundred yards of the lake's shore. Construction of the campus and north access road could degrade water quality in SR by increasing the amount of suspended solids entering the lake. During operation of the SSC, runoff from roads and parking lots in the campus area could contaminate the lake with oils, grease, and road salt. The impact of contaminated runoff on water quality in SR could be mitigated by the use of retention ponds; however, it may still be necessary to replace SR as the water-supply lake for Carbondale. The City of Carbondale has agreed to abandon Strowbridge Reservoir and seek alternatives, if necessary (see Section 6.2.1 and Volume 6, appendix 2). Likely alternatives for water sources for Carbondale are the City of Topeka or Pomona Lake. It is unlikely that the recreation potential of SR would be adversely impacted because public access to the lake would be safeguarded, and any water-quality degradation would probably not be severe enough to affect aquatic life or non-contact recreation.

A portion of the Osage County State Fishing Lake (OCSFL) watershed lies within the injector area. Therefore, the lake could be subject to some siltation caused by construction activities. However, surface construction for the injectors would be minimal and most of the runoff would be intercepted by existing watershed ponds. These small ponds would remove most of the suspended solids by sedimentation.

After construction of the SSC is completed, the probability exists that water quality in SR and OCSFL

TABLE 5.11—TYPES AND AMOUNTS OF LAND WHICH WOULD BE DIRECTLY IMPACTED BY CONSTRUCTION OF THE SSC. Prairie is native bluestem prairie used for pasture; modified grassland is cool-season pasture of mostly introduced grasses; woodlot is adventive woodlands; row crops are mostly corn, soybeans, sorghum, and wheat. No native forestland was found at the campus and cluster areas. For purposes of estimation only, we assumed that surface construction in areas B and C would be negligible. QR are subjective habitat ratings based on 1 to 10 with 10 being the best. HU are habitat units which are the product of the QR and the number of acres. HU's are useful for comparing similar habitats of differing size and quality for the purpose of mitigation.

	Prairie			Modified Grassland			Woodlot			Row Crops		
Site	Acres	QR	HU	Acres	QR	HU	Acres	QR	HU	Acres	QR	HU
A	—	—	—	110	3.5	385.0	—	—	—	290	4.0	1160
E1	—	—	—	—	—	—	—	—	—	0.9	4.0	3.6
2	—	—	—	0.45	3.5	1.6	—	—	—	0.45	4.0	1.8
3	—	—	—	—	—	—	—	—	—	0.9	4.0	3.6
4	—	—	—	—	—	—	—	—	—	0.9	4.0	3.6
5	—	—	—	0.9	3.5	3.2	—	—	—	—	—	—
6	—	—	—	0.9	3.5	3.2	—	—	—	—	—	—
7	—	—	—	0.45	3.5	1.6	—	—	—	0.45	4.0	1.8
8	0.9	6.0	5.4	—	—	—	—	—	—	—	—	—
9	—	—	—	—	—	—	—	—	—	0.9	4.0	3.6
10	—	—	—	0.9	3.5	3.2	—	—	—	—	—	—
F1	—	—	—	3.4	3.5	11.9	—	—	—	2.3	4.0	9.2
2	—	—	—	1.7	3.5	6.0	—	—	—	4.0	4.0	16.0
3	—	-	—	—	—	—	—	—	—	5.7	4.0	22.8
4	—	—	—	—	—	—	2.3	5.3	12.2	3.4	4.0	13.6
5	2.8	3.5	9.8	2.9	3.5	10.2	—	—	—	—	—	—
6	—	—	—	—	—	—	—	—	—	5.7	4.0	22.8
7	—	—	—	—	—	—	—	—	—	5.7	4.0	22.8
8	2.8	3.5	9.8	—	—	—	—	—	—	2.9	4.0	11.6
9	—	—	—	—	—	—	—	—	—	2.7	4.0	10.8
10	—	—	—	—	—	—	—	—	—	2.7	4.0	10.8
J1	—	—	—	12	3.5	42.0	8	7.3	58.4	20	4.0	80.0
2	—	—	—	24	3.5	84.0	—	—	—	16	4.0	64.0
3	—	—	—	28	3.5	98.0	—	—	—	12	4.0	48.0
4	—	—	—	4	3.5	14.0	—	—	—	36	4.0	144.0
5	—	—	—	16	3.5	56.0	—	—	—	24	4.0	96.0
6	—	—	—	20	3.5	70.0	—	—	—	20	4.0	80.0
K1	—	—	—	3.1	3.5	10.9	—	—	—	—	—	—
2	—	—	—	3.1	3.5	10.9	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	3.1	4.0	12.4
4	1.5	3.0	4.5	—	—	—	—	—	—	1.6	4.0	6.4
5	—	—	—	1.6	3.5	5.6	1.5	3.8	5.7	—	—	—
6	—	—	—	3.1	3.5	10.9	—	—	—	—	—	—
TOTAL	8.0	5.3*	42.1	236.5	3.5*	828.2	11.8	6.5*	76.3	462.3	4.0*	1849.3*

*average habitat quality

TABLE 5.12.—TYPE AND ACREAGE OF LAND POTENTIALLY IDLED BY ACQUISITION FOR THE SSC. For purposes of estimation only, we have included areas B and C in this category because surface construction in those areas would be negligible.

Site	Prairie	Modified Grassland	Woodlot	Row Crops
B	—	740	—	1050
C	—	530	20	1040
Near cluster[a]	—	580	140	1000
Far cluster[a]	20	1000	40	510
TOTAL	20	2850	200	3600

a. Excludes E, F, J, and K sites which are listed on Table 5.11.

TABLE 5.13.—ACREAGE, HABITAT-QUALITY RATINGS, AND HABITAT UNITS FOR QUARRIES AND STRIP MINE TO BE USED AS TUNNELING-SPOILS-DISPOSAL SITES.

Quarry Reference Number	Acres	Habitat Quality	Habitat Units
2	134	5.0	670
4	115	3.0	345
7	115	2.0	230
11	32	4.0	128
15	90	6.5	585
17	58	2.5	145
19	64	2.0	128
TOTAL	608	3.7*	2,231

* average habitat quality

could be improved due to changes in land use within the lakes' watersheds. Sixty-eight percent and 25 percent of the watersheds for SR and OCSFL, respectively, would be purchased for the SSC, and agricultural activity (row cropping and grazing) on that land could be halted. The present contaminants in runoff into these lakes, which would then be reduced, are suspended solids, pesticides, and nutrients from fertilizers.

Although the proposed location of the SSC surrounds Pomona Lake and 45% of the lake's watershed, the lake would not be significantly impacted by the project if water for the project (and possibly Carbondale) is supplied by the City of Topeka. The amount of additional suspended solids which might be generated by construction of the service and access areas within the lake's watershed would be trivial compared to the amount of suspended materials which currently exist in the lake. If Pomona Lake is used as a water supply for the SSC, the major impact would be withdrawal of up to 3 million gallons per day (mgd) of water. The Corps of Engineers has indicated that 5.33 mgd may be obtained from Pomona Lake even in a severe drought and not curtail maintenance of downstream flows. Withdrawal of water for the SSC could impact reservoir recreation by inducing greater drawdowns of the conservation pool. A computer simulation was used to examine the impact of withdrawing 3 mgd from Pomona Lake over the period 1940-1986. As a baseline condition, a simulation was conducted with no withdrawals. The drawdown from using Pomona Lake as the water supply for the SSC was not appreciably different to normal operations, except during extended drought conditions (Figure 5.10). Simulated drawdowns during the 1952-57 and 1976-77 drought periods were more extreme when water-supply withdrawals were made. However, the drought conditions induced most of the drawdown, as indicated by the baseline condition. The water-supply withdrawal was responsible for the additional drawdown of 4.5 feet during the most severe drought. Nonetheless, the recreation utility of the reservoir would have already been rendered marginal by the drought-induced drawdown. Recovery of the conservation pool after the drought was not affected by the use of the reservoir as the SSC water supply. If less water is used from Pomona Lake, drawdowns would approach the baseline conditions.

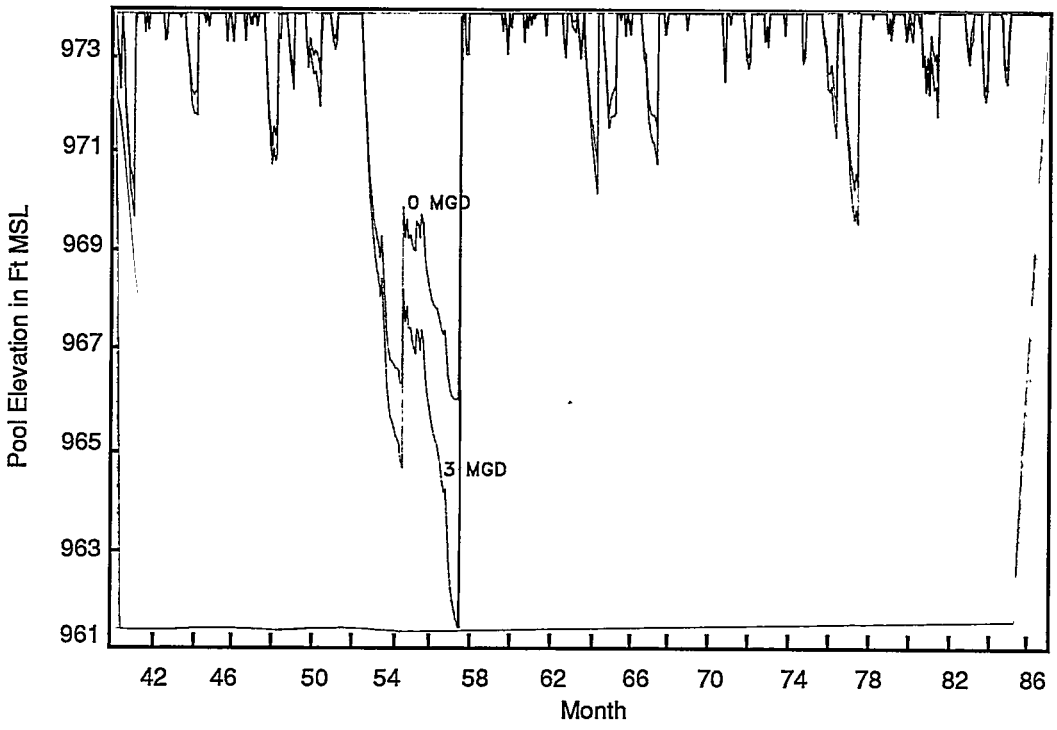


FIGURE 5.10—RESULTS OF A COMPUTER SIMULATION OF WATER LEVEL IN POMONA LAKE WITH AND WITHOUT AN ADDITIONAL 3 MGD WITHDRAWAL FOR THE SSC. The difference between the two lines represents the effects of withdrawal for the SSC. Except during drought conditions, the difference between the two simulation conditions is negligible.

This simulation suggests that the impact of a direct water-supply withdrawal by the SSC on the conservation pool would not be significant.

The SSC project would generate point sources of potential water pollution in the form of discharge from construction dewatering, domestic-type wastewater produced at the campus area during operation, and leachate from tunnel spoils-disposal sites. Water removed from underground construction areas will be either fresh or brackish. Freshwater can be used for irrigation and dust control or discharged into a nearby stream channel without creating significant adverse impacts. To avoid contaminating the environment, brackish ground water would be collected and disposed of by reinjection into a geologic stratum considerably below the collider ring. Domestic wastewater from the campus should not have a significant environmental impact if appropriate existing technology (e.g., non-discharging lagoons) is used. Leachate from the spoils-disposal areas could be contaminated with brine, be slightly radioactive, or be acidic. Adverse effects of this leachate on ground and surface waters can be prevented if proper techniques (e.g., impervious barriers) are employed when disposing of the small proportion of tunnel spoils which could be contaminated (Section 3.5.5).

Ecological Resources

As indicated in Section 5.8.4, only about 670 acres of land would be directly impacted by surface construction for the SSC. These areas were evaluated for wildlife-habitat quality by personnel of the Kansas Fish and Game Commission (Table 5.11) and for the existence of threatened or endangered plant species by a staff member of the Kansas Biological Survey. Habitat quality was rated using a subjective procedure based on a scale of 1 to 10. A rating of 10 represents the best possible conditions for wildlife. For each site, the quality rating was multiplied by the acreage to determine the number of habitat units. These units are useful for comparing similar habitats of differing size and quality for the purpose of mitigation.

Although 8 acres of native prairie would be lost to construction of the SSC, the prairie that would be destroyed

is not of very high quality (average habitat-quality rating = 5.3; Table 5.11). The 11.8 acres of woodlot habitat which would be lost has a relatively higher value for wildlife (quality rating = 6.5) than the prairie. The remaining 97 percent of the land directly impacted is modified grassland or row crop, which have relatively poor habitat-quality ratings (3.5 and 4.0, respectively).

Land for the SSC on which significant amounts of surface construction will not occur (Table 5.12) would also be purchased. With the appropriate management, these relatively undisturbed lands could be improved in order to offset the habitat lost due to surface construction. This could be accomplished if the habitat-quality ratings of the undisturbed areas were improved by the following amounts: prairie, 2.1; modified grassland, 0.3; woodlot, 0.4; and row crop, 0.5. Techniques which might have to be employed are removal of livestock, reseeding, and periodic burning of grasslands.

The disposal of the tunneling spoils will impact approximately 608 acres of old strip mines and quarries. At some of these sites, some natural revegetation has occurred since abandonment. However, the habitat at most of these sites was judged to be of relatively poor quality (Table 5.13). Therefore, after construction is complete, it should not be difficult to create habitat quality equal or superior to the original conditions of the disposal sites.

No threatened or endangered species of plants or animals would be impacted by the SSC at the proposed site. Although some native prairie would be destroyed, these locations do not contain any of the threatened or endangered plant species which are associated with tall-grass prairie. No threatened or endangered animal species would be impacted because no critical habitat for those species exists within the proposed SSC site.

No wetlands would be affected because none were found to exist on land which would be purchased for the SSC. However, some small ponds which exist at the proposed tunneling/spoils-disposal sites would be filled. These losses could be mitigated if similar-sized ponds were included in the disposal-site reclamation plans.

Health and Safety

The SSC may result in some increase in the risk to the general public of traffic accidents and radiation exposure. The risk of traffic accidents may increase for several reasons. The increase in population density in the immediate vicinity of the SSC and number of people commuting to the facility will increase traffic density. Dust created by construction activities could also, under extreme circumstances, reduce visibility on highways. During operation, fog produced by the cooling towers under certain climatic conditions could also have a similar effect. However, the overall increase in risk of traffic accidents should be slight because of existing low density of traffic and the lack of "rush-hour" type traffic conditions produced by the SSC.

A negligible possibility of exposure to radiation exists for the general public either from an accident during operation of the collider ring or an accident during the transport of radioactive waste off the site. The impact on the general public of accidental radiation released by the ring would be negligible because the ring will be buried at least 50 to 325 feet below ground. This is about two to 11 times the amount of overburden considered necessary to protect against this type of radiation release. No probability of radiation exposure for the general public exists during normal operation of the collider. The risk of exposure posed by transport of radioactive waste is minimal because of the low population density and high quality of the existing transportation infrastructure.

Air Quality

Although it is relatively minor, the main impact on air quality associated with the SSC would occur during the construction phase in the form of particulates from various sources. Disturbance of topsoil and vegetative cover during surface construction will make soil particles vulnerable to wind erosion. This can be alleviated by the use of any available windbreaks or construction of temporary ones, placement of construction materials to minimize disturbance of the soil from on-site transportation, wetting and covering earth piles, or any other viable means. Transporting spoils from tunnel excavations will require frequent trips between tunnel-access points and spoils-disposal sites. Most of this traffic would be over unpaved roads, thus creating another source of airborne dust. Fortunately, at the Kansas proposed site, the disposal sites are located close to tunnel openings with an average drive of 4 miles and a maximum of 7 miles. Routes to these sites would avoid local traffic so that any resulting dust would be a minimal visibility hazard. Regular spraying of these roads with water or approved oil can further minimize the production of fugitive dust. Construction of the SSC will require a great deal of concrete and asphalt. Kansas regulations stipulate that placement of portable facilities for making these materials must minimize the impact of their dusts and fumes on nearby residences, roadways, and parks. The operation of construction machinery and the transport of people and materials would entail an increase in emissions from internal combustion engines. The dusts and fumes from all these sources would have little impact on air quality because of the region's excellent existing air quality and high dispersion factor (Section 5.5).

Operation of the SSC will entail very little negative impact on air quality. Emissions from traffic to the campus, tunnel-access buildings, and refrigeration

facilities will be dispersed as noted above. Heating and air conditioning systems on the campus will use either electricity or natural gas, both of which produce clean exhaust. A positive impact could be a reduction of particulates from the land in the near and far clusters, the campus, the injector site, and the future expansion area if these areas are removed from agricultural production. Because plowing and leaving exposed soil between crop rows enhances wind erosion, the contribution from such agricultural areas to total suspended particulates would be decreased if these areas were no longer farmed.

Noise

The main source of increased noise generated by the SSC will be from increased traffic. Therefore, future noise levels were computed using the Federal Highway Administration Stamina 2.0 computer program with the increase in traffic estimated to be less than double. During the construction and operation of the SSC, noise impacts (i.e. noise levels that exceed existing noise levels) will be experienced primarily along U.S. Highways 56 and 75 due to the increase in traffic volumes. A 1 to 2 dBA-Leq(h) increase is anticipated adjacent to those routes. Because the campus area of the SSC will be located on what is now rural countryside, higher impacts will be experienced in this area. Higher impacts will also be experienced in towns located on U.S. Highways 56 and 75 and in other communities in the region due to the increase in local traffic brought about by economic growth associated with the SSC. However, only a few noise-sensitive receptors (e.g., churches, schools, and nursing homes) would be impacted by the slight increase in traffic noise.

Historical and Archeological Resources

Five barns and three farmsteads, which could be eligible for listing on the National Register of Historic Places, exist on land which would be purchased for the campus, injector, and future expansion areas. The impact on these structures would be determined by the final site plan, but it appears that none are located where necessary surface construction would take place. Therefore, these buildings could be preserved and even incorporated into the infrastructure of the project, thus providing an interesting juxtaposition of a rugged simpler past and a high-technology future.

Several historical and archeological sites are located near the proposed SSC areas. Two farmsteads are located in the vicinity of the E2 Access Area and one farmstead in the vicinity of F7 Service Area. Two prehistoric sites are located in the vicinity of the F6 Service Area. These properties will not be directly affected, but indirect impacts on the buildings will need to be assessed. The Utopia limestone stratum exposed in the strip mines and quarries which would be used as tunneling spoils-disposal sites has yielded fossilized footprints of amphibians from the Late Pennsylvanian era. Therefore, before they are filled, the disposal sites should be thoroughly surveyed by paleontologists. Otherwise no known paleontological sites would be impacted by the SSC.

A currently active cemetery exists in the injector area 3 miles southeast of Carbondale. Moving the cemetery would have only minor environmental impact, but no impacts would occur if an easement to the site were allowed.

Socioeconomic Impact

SSC construction will cost about $4.4 billion, of which $932.8 million would be spent on the site construction. The construction phase will run from 1989 through 1997. Since no detailed plan of the construction process exists, annual construction expenditures for the site were estimated using the overall construction costs as a basis. From the annual estimated construction costs at the site, the economic impact of construction on the Kansas economy was estimated using the Kansas Long Term Model (KLTM) for the state's economy. This model is under development at the Institute for Public Policy and Business Research at the University of Kansas. The KLTM provides a dollar estimate of the increase in total demand for goods and services and what that increased demand would represent in increased personal income. These estimates for each year of construction are listed on Table 5.14. The total increase in demand for the Kansas economy would be $1.9 billion and the increase in state personal income would be $830 million.

The construction of the SSC in Kansas would have two types of effects on the State budget. Because some construction workers from outside the State would migrate into Kansas for the project, demand for State services would increase, resulting in an increase in State expenditures. For a preliminary estimate of this effect, we have assumed the first 2,000 construction workers hired for the project would be Kansas residents; as the Kansas supply of construction workers diminished, one half of the rest of the construction workers hired would come from out-of-state. These workers would bring families, requiring additional Kansas governmental expenditures. The DOE estimates that an operations staff of 3,000 would generate 10,000 total family members. We have assumed a slightly smaller family size of only three persons for the construction workers from out-of-state. For FY 1985, per capita Kansas State government expenditures were $1,126.34. The increase in State government expenditures were estimated by multiplying the number of out-of-state construction workers by per capita State government expenditures (rounded to $1,150) and then multiplying this result by three to account for family size.

The second type of effect on the State budget generated by SSC construction in Kansas would be increased revenues. Rather than estimating the whole effect, we have estimated the two major taxes, sales tax and personal income tax, which represent about 80% of all State revenue. Both of these were estimated using the annual estimates of personal income. The annual estimates of these two types of effects—increased expenditures and increased revenue—can be found in Table 5.15. The total increase in expenditures is $21.3 million while the total increase in revenue is $31.9 million. The net result is an addition of $10.6 million to the State treasury.

The annual budget for the operations phase of the SSC project has been estimated at $250 million. Since the SSC project, during the operation phase, is going to be energy and labor intensive, we used the KLTM multipliers for the transportation and utilities sector to estimate the effect of the operations budget on the Kansas economy. The KLTM estimates that the $250 million budget would generate a $600 million increase in demand for Kansas goods and services, and an increase of $289.4 million in state personal income. The expected size of the operations work force is 2,500 permanent staff and 500 visiting staff. The DOE estimates that the combination of work force and their families will be 10,000 people. Assuming that 8,000 of these people will be new residents of Kansas, State expenditures would need to increase $9.2 million annually to accommodate them. On the other hand, sales-tax revenues and income-tax revenues are estimated to annually increase $5.7 million and $5.4 million, respectively. Thus, total new annual revenue generated would be $11.1 million or $1.9 million more than the new annual expenditures generated.

The economic impact on the four-county region nearest the proposed site (Osage, Shawnee, Douglas, and Franklin counties) would be significant. Given the preliminary nature of this analysis and the difficulty in making reasonable assumptions about labor-market activity and migration patterns, only a qualitative analysis of the economic impact of the SSC on this four-county region will be presented. In 1984, the region had a labor force of 131,019, which included construction employment of 4,318 and unemployment of 8,320. Since the existing construction sector in the region would be too small to meet the increased employment demand, the region's construction capacity would likely expand. The region's manufacturing sector is relatively small, accounting for only 7.7% of the state's manufacturing employment (the region accounts for 11% of the state's population). The SSC, in either its construction or operation phase, would probably not significantly alter this sector of the region's economy. However, transportation and utilities; wholesale and retail trade; finance, insurance, and real estate; and other service sectors are relatively well developed in the region. Since these sectors typically locate close to their sources of demand, they should experience, at least in some cases, a substantial increase in demand for their goods and services.

TABLE 5.14—ECONOMIC IMPACT ON THE KANSAS ECONOMY OF CONSTRUCTION OF THE SSC, IN MILLIONS OF DOLLARS.

Year	Construction costs	Increase in demand	Increase in personal income
1989	7.5	15.2	6.7
1990	74.2	150.6	66.1
1991	131.1	266.1	116.7
1992	143.9	299.2	128.1
1993	142.8	289.9	127.2
1994	147.3	299.0	131.2
1995	151.2	306.9	134.6
1996	95.3	193.5	84.9
1997	39.5	80.2	35.2
TOTAL	932.8	1,893.5	830.7

Local government expenditures would necessarily increase during both the construction and operation phases. Most of the SSC workers would probably live in rural areas and small towns near the site, although some would locate in Topeka, Lawrence, and Ottawa. The resulting increase in population would greatly affect the socioeconomic situations of the rural areas and small towns.

The amount of the increase in expenditures would depend on the extent and location of in-migration, preferences of the population for public expenditures, and the quantity and quality of the existing infrastructure. Increased government expenditures would include expenditures for road improvement, additional capacity for public utilities, expansion of the educational facilities, and additional governmental administrative costs. Road and utility expenditures would be needed for the construction phase and would serve the operations work force as well. The single greatest expenditure item for local governments is education and this would increase dramatically, particularly when the operation workers and their families moved into the region.

About the same time that local governments experienced an increased demand for services, the tax base would grow due to increased population. Not only would the increase in population increase local government revenues, it would increase economic activity in the area which would further increase the tax base, especially during the operations phase. Additionally, the operations staff is expected to have an average income well above the current average in these counties. As a result, their purchases of homes is expected to raise the property values of the currently existing homes. Thus, the increase in local-government expenditures and the increase in local-government revenues due strictly to the increase in population appear to balance.

Of the four counties in the region, Osage County would be affected the most. The purchase of land for the SSC would involve 59 homes. The average household size in Osage County is 2.67 persons, which suggests that between 150 and 165 people would be displaced. This estimate implies a population density in the displacement area of about 10 persons per square mile, compared to the county-wide density of 23.2 and the state-wide density of 29.8 persons per square mile.

Property-tax revenues within Osage County would decline slightly because of the State's purchase of the land for the SSC project. This loss is estimated at $37,000 per year, less than 1% of the county's property-tax revenue. This estimate was calculated by multiplying the 9,700 (the approximate amount of acreage to be purchased by the State for the project) by the average assessed valuation of rural acreage in Osage County and then multiplying the product by the average property-tax rate for rural Osage County.

TABLE 5.15—THE IMPACT OF CONSTRUCTION OF THE SSC ON THE STATE BUDGET OF KANSAS, IN MILLIONS OF DOLLARS.

Year	Increased State Expenditure	Increased State revenue		
		Sales tax	Income tax	Total
1989	0.0	0.1	0.1	0.2
1990	0.4	1.3	1.2	2.5
1991	3.3	2.3	2.2.	4.5
1992	3.9	2.5	2.4	4.9
1993	3.9	2.5	2.4	4.9
1994	4.1	2.6	2.4	5.0
1995	4.3	2.7	2.5	5.2
1996	1.4	1.7	1.6	3.3
1997	0.0	0.7	0.7	1.4
TOTAL	21.3	16.4	15.5	31.9

Agricultural income in Osage County would decline slightly due to the loss of approximately 4,000 acres of row crop and 3,100 acres of pasture. This would represent 2.1% of the harvested land and 1.8% of the pasture in Osage County. The annual worth of the crops and livestock represented by this loss would be $390,000 and $261,000, respectively, based on 1984 production values. Production costs for Osage County are not available; therefore, the loss of net income cannot be estimated directly. However, estimate of income loss can be made based on the 1987 state-wide average rental prices for non-irrigated cropland and pasture, which are $28.60 and $10.81 per acre per year, respectively. This estimating procedure gives a projected loss to Osage County of $148,000 of agricultural income per year, which translates into a loss of almost $500 a year in sales-tax revenue for Osage County.

As with the State, the decline in revenue due to the SSC project is more than matched by the increase in revenue as a result of the project. The increase in Osage County population can only be estimated at this point. However, because the county has a one-percent sales tax, county revenue will be increased by both county residents and workers from outside the county. Assuming that one-quarter of the personal income generated by the construction phase of the project would stay in Osage County, which may under-estimate the impact on the county sales tax, the annual increase in revenue for Osage County will exceed the loss in revenue by the second year of construction (Table 5.16). The totals indicate that nearly twice as much revenue is generated by construction of the SSC than is lost by the State's purchase of Osage County land. Using the same assumption that one-quarter of the personal income would stay in Osage County, $240,000 in sales-tax revenue would be generated during the operations phase, while $37,500 of tax revenue would again be lost to the county.

The estimates for sales-tax revenues might seem smaller than expected, even taking into account a conservative assumption about how much of the personal income stays in Osage County. The reason for the small estimates for sales tax generated in Osage County is that Osage County is a low per capita sales tax county: $74.04 per capita sales tax revenue as compared to $196.39 per capita sales tax revenue for the state. As the county's population increased due to the SSC project, the retail sector of the county economy would expand, and more money spent by county residents on retail trade would be spent inside the county.

The increase in population in Osage County generated by the SSC would increase demand for local government services. But as previously discussed, the additional population would also add to the tax base. These conflicting fiscal impacts will probably balance out over the long run. However, in the short run, a time lag could develop with the revenue losses to Osage County

TABLE 5.16—THE IMPACT ON OSAGE COUNTY GOVERNMENT FINANCES OF CONSTRUCTION OF THE SSC, IN MILLIONS OF DOLLARS.

Year	Lost revenue in Osage County			Increased local sales tax revenue
	Property tax	Local sales tax	Total	
1989	37.0	0.5	37.5	5.7
1990	37.0	0.5	37.5	50.2
1991	37.0	0.5	37.5	97.5
1992	37.0	0.5	37.5	106.9
1993	37.0	0.5	37.5	106.2
1994	37.0	0.5	37.5	109.5
1995	37.0	0.5	37.5	112.4
1996	37.0	0.5	37.5	70.9
1997	37.0	0.5	37.5	29.4
TOTAL	333.0	4.5	337.5	688.7

coming before the increase in county sales tax revenues. To mitigate this and other negative socioeconomic impacts and to maximize the benefits from the SSC, the State of Kansas has created a committee within the state Department of Commerce to assist the affected towns and counties by providing expertise in economic development.

The SSC would also have a profound influence on education and educational institutions throughout the state. Having a state-of-the-art research facility nearby would present numerous possibilities for stimulating the study of science in primary and secondary schools. The proximity of the research facility alone should raise the level of awareness of scientific research. Of a more concrete nature would be the impact of the SSC facility on Kansas colleges and universities, particularly the University of Kansas at Lawrence and Kansas State University at Manhattan. The physics departments at both institutions should benefit from the advantages presented to graduate programs and the enriched possibilities for advanced research.

The social and cultural impact of the SSC project on Osage County would be of two natures: during the construction phase Osage County would face many of the classic problems associated with "boom towns," while during the operations phase the basic economic structure of the county would be significantly altered on a more or less permanent basis. The construction phase would introduce workers whose expected stay would be temporary. These workers would be typically interested in temporary housing and less concerned with community matters. In contrast, the population moving into Osage County during the operations phase would be more concerned with permanent housing and would probably be more interested in community matters. The operations phase would instigate the most far-reaching changes in Osage County.

During the operations phase, the SSC would employ more than ten times as many people as the largest existing Osage County employer. The SSC would become the dominant factor in the social and economic structure of the county. The SSC's role in Osage County would be much like the role played by the University of Kansas in Douglas County or Kansas State University in Riley County. The overall educational level of the adult population would increase as highly trained, educated people moved in to operate the SSC facility. These people would demand improvements in the local public-education system and expansion of cultural resources. These changes would benefit the native population that shares these interests. The economic base and public perception of the area around the SSC would be shifted away from agriculture, which currently dominates the life-style of Osage County. The significant increase in the urbanization of a predominately rural county would have a striking impact on the culture of the area. Eighty percent of Osage County is rural. For comparison, the rural populations of Douglas, Franklin, and Shawnee counties represent, respectively, 13%, 50%, and 19% of their total populations.

The social and cultural impact of the SSC project on Douglas, Franklin, and Shawnee counties should be less than on Osage County. However, these counties should experience significant growth and development and the problems that go with them The cultural impact on these counties should be minimal. Other, more distant counties that could also be affected by the SSC include Lyon and Johnson counties because they contain the population centers of Emporia and the suburbs of Kansas City, respectively.

References

Berendsen, P., and Hathaway, L. R., 1977, Mineral potential of shales of Middle and Upper Pennsylvanian age in southwestern Kansas: Kansas Academy of Science, Abstract.

Brunson, K., 1980, Marais des Cygnes River basin, Kansas, stream survey: Kansas Fish and Game Commission.

Holzworth, G. C., 1972, Mixing heights, wind speeds, and potential for urban air pollution throughout the contiguous United States: Environmental Protection Agency, Research Triangle Park, North Carolina, Publication AP-101.

Kansas Department of Health and Environment, 1986, Kansas Air Quality Summary, 1985, Topeka, Kansas.

Runnels, R. T., Schleicher, J. A., and Van Nortwick, H. S., 1953, Composition of some uranium-bearing nodules from Kansas shales: Kansas Geological Survey, Bulletin 102, pt. 3.

Site Proposal for the Superconducting Super Collider

Kansas

Volume 6

Setting

For more information, contact:

SSC Project Office
Kansas Department of Commerce
400 W. 8th, Suite 500
Topeka, Kansas 66603
(913) 296-5272

Cover art from the original painting "*Explosion of Creation*" by Kansas artist Philomene Bennett

Cover design by Jennifer Sims, Kansas Geological Survey

Contents

6.1 GENERAL 1
6.1.1 Placement of SSC Facilities in Proposed Area 1
6.1.2 Relevant Natural and Manmade Features 4
6.2 REAL ESTATE ACQUISITION PLAN 7
6.2.1 Scope of Acquisition 7
6.2.1.1 Types of Estate 7
6.2.1.2 Number of Parcels and Ownerships 7
6.2.1.3 Land Owned by Governments 7
6.2.1.4 Configuration, Acreage, Estates, and Dimensions of Proposed Site 8
6.2.1.5 Residences and Businesses Requiring Relocation 8
6.2.2 Method of Acquisition 8
6.2.2.1 Proposed Method of Site Acquisition 8
6.2.2.2 Summary of Existing Legislation 10
6.2.2.3 Condemnation Authority 11
6.2.2.4 Government-owned Land 11
6.2.2.5 Assistance from DOE 11
6.2.2.6 Personnel Acquiring Property 11
6.2.3 Schedule of Acquisition 12
6.2.3.1 Completion of Appraisal 12
6.2.3.2 Completion of Survey 12
6.2.3.3 Receipt of Title Evidence 12
6.2.3.4 Commencement of Negotiations 12
6.2.3.5 Filing of Condemnation Proceedings 12
6.2.3.6 Completion of Acquisition 12
6.2.3.7 Completion of Relocation of Residences and Businesses 13
6.2.3.8 Completion of Relocation of Roads, Cemeteries, etc. 13
6.2.3.9 Potential Delays 13
6.2.4 Additional Available Land 13
6.3 OTHER INFORMATION 14

Figures

6.1—Location of proposed site 1
6.2—Aerial view of north cluster area 3
6.3—DOE idealized conceptual site 4
6.4—Kansas proposed site for the SSC 5
6.5—Location of site changes proposed for greater development flexibility 6
6.6—Improvements that require relocation 9

Plates

6.1--Site plan of proposed Kansas SSC site
6.2--Location of tracts to be acquired for project with reference to estate
6.3--Numerical distribution of tracts to be acquired around collider ring

Appendices

1—Certificate of Appropriation
2—Letter from City of Carbondale
3—K.S.A. 82a-708b
4—Matrix of Disposition of Structures on SSC Properties
5—Agreement between Kansas Power and Light Company and Kaw Valley Electric Cooperative
6—Appraisal Review
7—Letter Offering Fair-Market Value
8—Irrevocable Offers to Sell
9—Sample of Petition
10—1987 Session Laws of Kansas, Chapter 327
11—Eminent Domain Laws
12—K.S.A. 17-1350

Volume 6—Setting

6.1 GENERAL

6.1.1 Placement of SSC Facilities in Proposed Area

The Kansas SSC site is in east-central Kansas, approximately 60 miles southwest of Kansas City and 15 miles south of Topeka (Figure 6.1). The center of the collider-ring oval (coordinates X = 100,000, Y = 100,000) is located longitude 95° 38' 3" W and latitude 38° 41' 51" N, and the collider ring has an east-west orientation. Most of the ring and all of the campus, injector facilities, area for future expansion, interaction points, and the abort/external beam accesses fall within Osage County. Small portions of the collider ring (totaling about 11.5 miles), three intermediate access facilities (E-2, E-3, and E-4), and two service areas (F-2 and F-3) are located in Douglas and Franklin counties to the east.

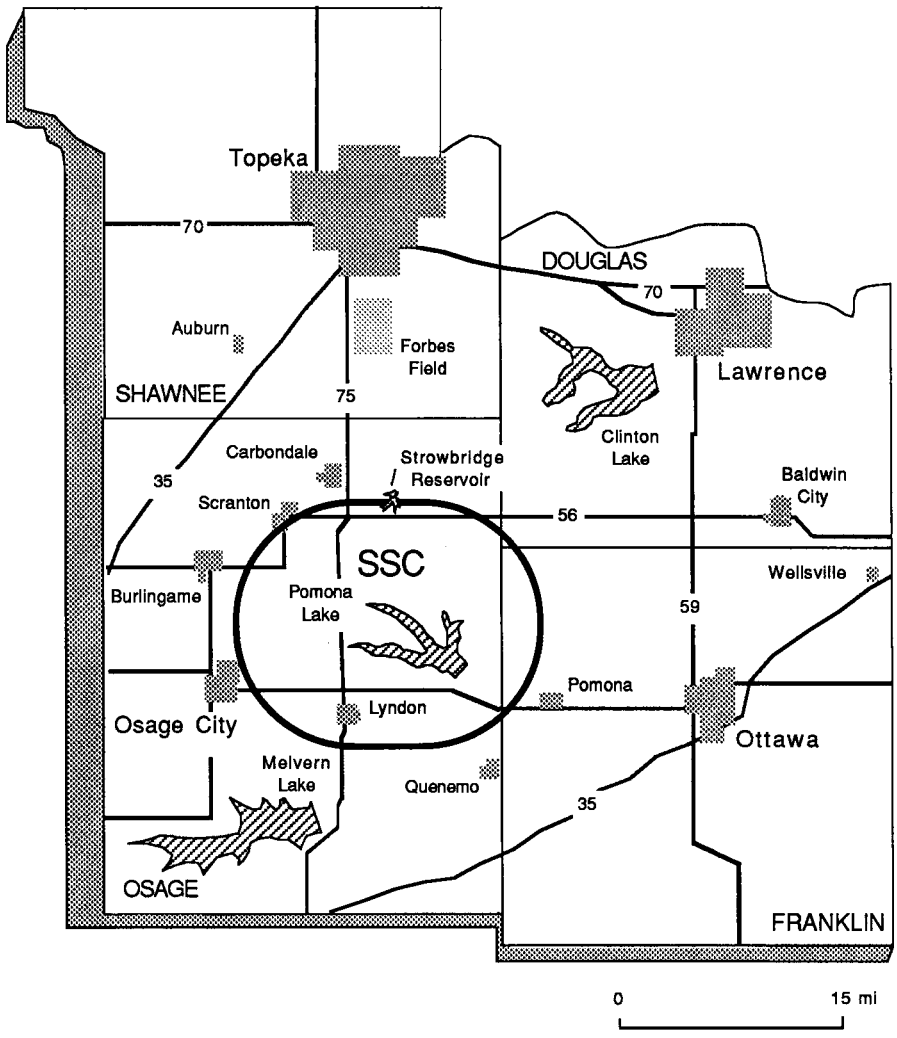


FIGURE 6.1--LOCATION OF PROPOSED SITE FOR SSC RING IN KANSAS.

Primary access from Topeka, the major nearby population and service center, is provided via U.S. Highway 75, a four-lane divided highway. Twelve miles south of Topeka, at the Carbondale exit, U.S. Highway 75 will intersect the SSC entry parkway. This 4-mile landscaped parkway, which will be constructed by the State of Kansas upon the state's selection as the SSC site, has a variable-width median and provides direct, four-lane access to the campus. From the Carbondale exit, the parkway will go east through a rural setting to Strowbridge Reservoir, wind around the west edge of this picturesque 246-acre lake, and turn south, leading directly to the central office laboratory building, the focal point of the SSC facilities (Figure 6.2) A secondary, four-lane divided entrance to the campus will extend northward from U.S. Highway 56 and pass east around the MEB (Medium Energy Booster), which is identified by a circular bosk of trees, and enter the campus area at a lake midway between the central laboratory, located to the west, and the technical buildings, located to the east. This entrance will afford quick and easy access to those coming from the southeast, southwest, and Interstate 35. A third point of access is planned for use primarily as a service entrance. This road will connect directly to the warehouse facilities, running west from a north-south road developed in the western part of tract C, an area set aside for future expansion. Developed in this way, the same road could receive traffic from either U.S. Highway 75 or U.S. Highway 56 and could provide access to the expansion site in the future. A fourth road will connect an existing cemetery located in the HEB (High Energy Booster) with Carbondale. This restricted-access, east-west road will provide direct access between the two but will not allow access to any facilities in the injector complex or campus (Plate 6.1). The main entrance to the campus is identified by a circular, double row of trees consisting of large shade trees on the outside and smaller, flowering trees on the inside. A semi-circle of trees identifies the other entrances to the campus area.

The campus is surrounded by approximately 4,300 acres of cropland and pasture, much of which may be restored to native grasses. The site is composed of open, level (2 percent) to slightly sloping (7 percent) terrain, and the campus occupies about 20 percent of the land devoted to its development. Campus development is essentially the same as the preferred scheme as prescribed by DOE's template (Figure 6.3 and Figure 6.4); however, the entire campus is shifted 150 feet to the north and the distance separating the central office laboratory and the technical buildings is increased by 150 feet. The close (400-foot) relationship between the central office laboratory and the LINAC (linear accelerator) is retained. The central laboratory is oriented so that the main point of arrival and entry is on the west side between the LINAC and laboratory, while the auditorium faces east. Parking for the central laboratory is on the north and south ends of the building. Each of these parking areas is heavily landscaped with large shade trees. The existing drainage swale between the lab and the rest of the campus is reshaped into a small lake. During construction, this lake will serve as a sediment trap, helping reduce the impact of runoff on Strowbridge Reservoir. After construction, the lake will be reshaped and, with the addition of walkways, trees, and shrubs, become the major landscape feature of the campus. Centrally located, the lake will be easily accessible to those using the auditorium, offices, conference rooms, and cafeteria in the central laboratory and to those working in the heavy-works area. The campus is surrounded by a two-lane road landscaped with a double row of shade trees on the inside and with open informal plantings on the outside. This loop road provides direct access to all buildings and service areas. Ancillary facilities, including an advanced waste-treatment sewage plant, are sited north of the campus, outside of the loop road. Several small ponds are developed around the outside edge of the campus. While these add to the aesthetic quality of the site, their primary purpose is to serve as sediment traps during construction and then as permanent stormwater-retention ponds afterward. An 8-acre pond is used to store effluent, which will be used to irrigate lawn and landscaped areas around the campus. The injector facilities are located immediately west of the campus and, like the campus, are sited in open, level-to-slightly sloping terrain. All buildings and service areas are sited as delineated in DOE's template.

The proximity to Strowbridge Reservoir offers DOE the opportunity to develop a recreation and fitness center close to campus, making it easily accessible to visitors, staff, and families of SSC employees during noon, after work, and on weekends. The site can accommodate a broad range of outdoor and indoor activities. Utilizing a recreation center and amphitheater as the focal point, facilities could be developed to support jogging, hiking, tennis, picnicking, boating, softball, and many other activities (Plate 6.1).

The remainder of the SSC facilities is dispersed around the collider ring as required. Since the majority of this region is open and nearly level farmland, most of the sites designated for service and experimental activities are easily accommodated as prescribed in the template. Interaction points K-5 and K-6 and intermediate access point E-6 are sited on topography that ranges up to 12 percent slope. However, each interaction point is in the south cluster, a purchased tract, which affords ample flexibility to do the necessary grading within the confines of the property. About 5 acres in the northwest corner of the 40-acre J-1 site have slopes ranging up to 15 percent. Slopes in the remainder of the site vary between 2 and 7 percent, offering sufficient space for development (Plate 6.1).



FIGURE 6.2—AERIAL VIEW OF NORTH CLUSTER AREA OF PROPOSED SITE.

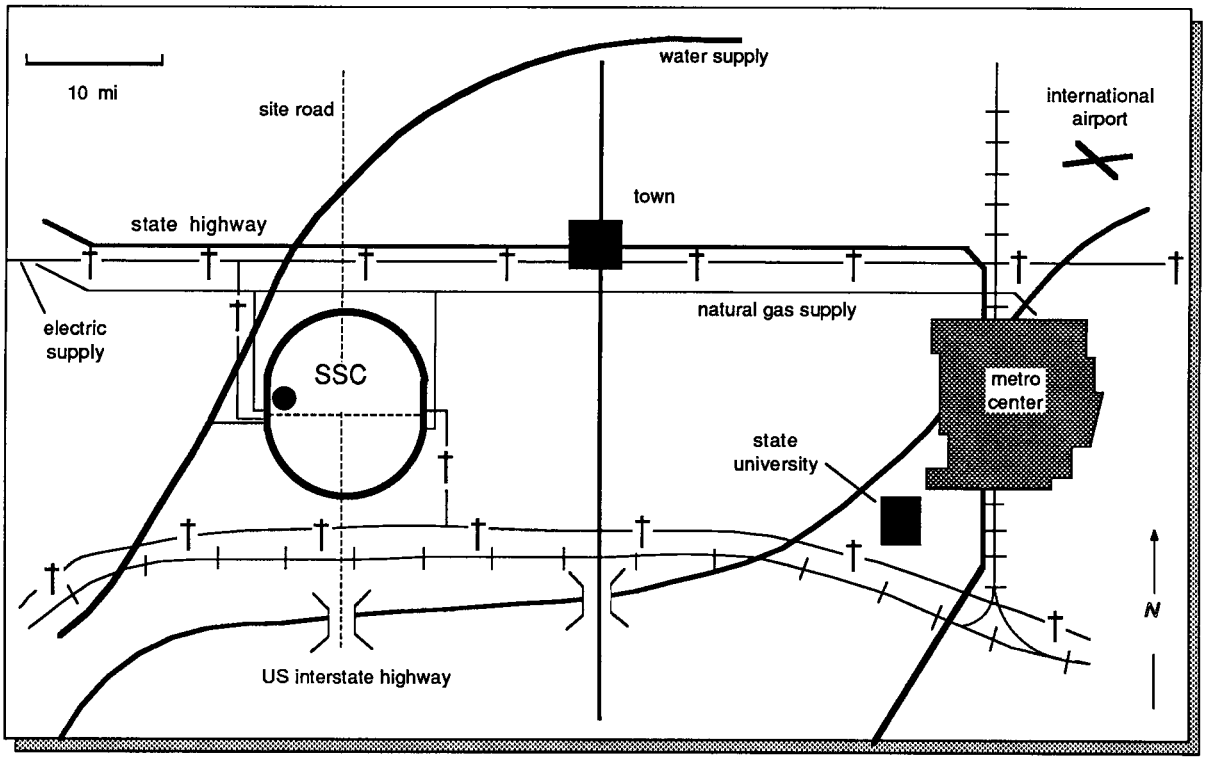


FIGURE 6.3--DOE CENTRAL DESIGN GROUP'S IDEALIZED CONCEPTUAL SITE OF THE SSC.

The locations of F-4, F-6, E-9, and J-3 are shifted slightly from those delineated on the template to provide more development flexibility at each site (Figure 6.5). Service area F-6 and intermediate access point E-9 have been relocated to remove them from the 100-year floodplains associated with surrounding creeks. F-6 is located 300 feet northwest, and E-9 has been moved 200 feet east (Figure 6.5). The dimensions of service area F-4 have been expanded to 600 feet by 600 feet and the site relocated 300 feet northeast of the site specified by DOE (Figure 6.5). These changes avoid steep topography and add greater flexibility for site development. To avoid a conflict with the existing Santa Fe railroad line, abort/external beam access point J-3 has been relocated 700 feet due west (Figure 6.5).

Access to the various facilities around the collider ring is provided by short service roads that connect to the existing network of county and state roads. These service roads, with a total length of approximately 4 miles, will first be used as construction roads and then will be placed into service as permanent, all-weather access roads (Plate 6.1).

6.1.2 Relevant Natural and Manmade Features

The proposed SSC site is in the Osage Plains section of the Central Lowlands physiographic province. This area is generally characterized as nearly level to gently sloping, with steeper topography occurring at the edges of stream valleys. The underlying geology consists of a series of relatively horizontal, sedimentary-rock units laid down late in the Pennsylvanian Period. The rock consists of cyclically deposited layers of marine limestone alternating with thicker layers of shale, which are considered to be a desirable tunneling medium for modern soft-rock tunnel-boring machines. A description of these formations and the placement of the collider ring within them is found in Section 3.2. Several surface mines and quarries are located near the SSC and, as discussed in Section 3.5, the excavated material from tunnel construction will be used to reclaim some of these.

Because the topography in this area is relatively flat, its impact on site selection and development is small.

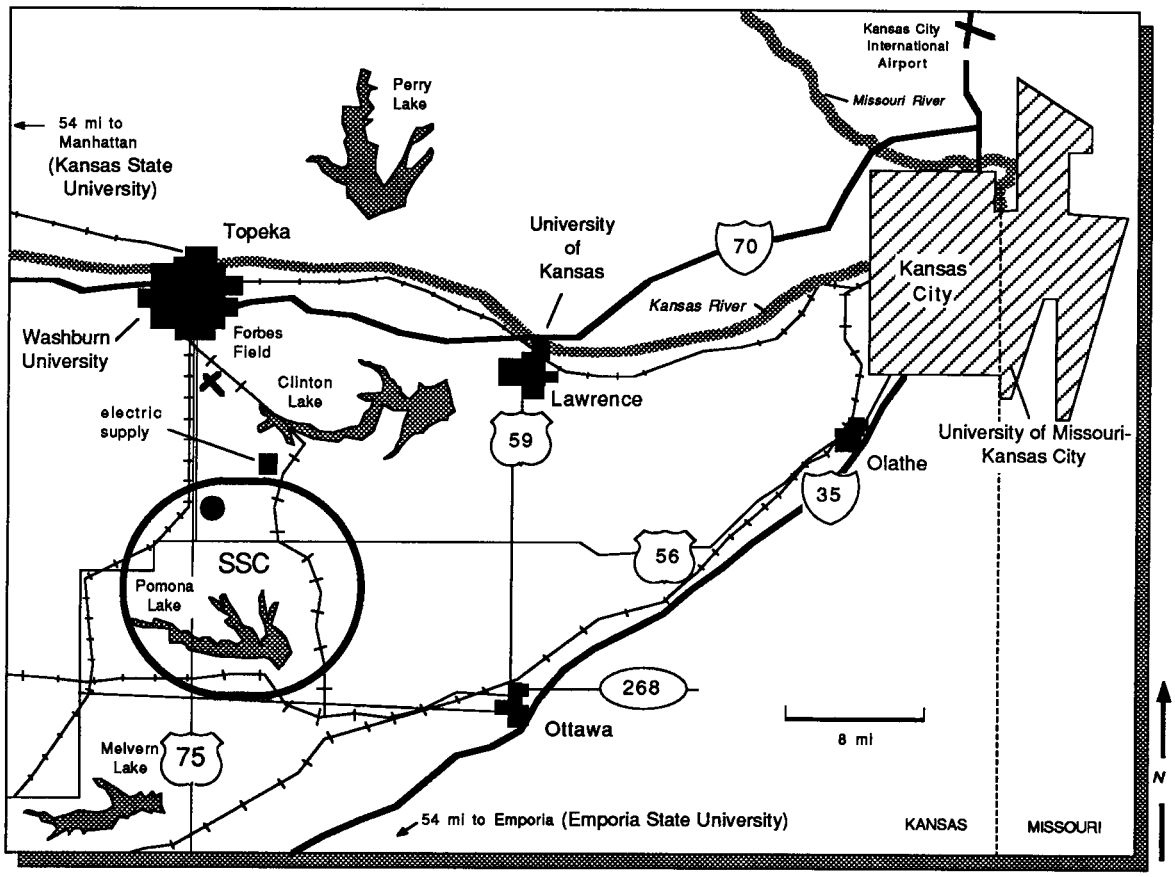


FIGURE 6.3—KANSAS PROPOSED SITE FOR THE SSC.

However, this aspect of the landscape offers ample flexibility for DOE to make adjustments in the final location and siting of facilities. Further, this terrain tends to minimize grading and the need for extensive sediment and erosion-control devices.

Several human-made features had major influence on selecting the proposed site; several will contribute to the cost-efficient construction and operation of the facility. The site is located in an area serviced by two major utilities, Kansas Power and Light (KPL) and Kansas City Power and Light (KCPL). Although these systems are interconnected, each has the capacity to provide more than 12 times the power needed to meet peak demands of the SSC. As discussed in Section 8.1 of this proposal, KPL will supply fuel for all SSC facilities and electrical power to the north cluster, campus, and injector facilities, while KCPL will supply power to the south cluster.

Abundant quantities of water to serve the campus and injector areas are available from two independent sources—the City of Topeka and Pomona Lake. As noted in Section 8.2, using water supplied by Topeka would require construction of booster-pump stations and a water main approximately 15 miles long, running from Forbes Field to the campus. Use of water from Pomona Lake would require construction of about 10 miles of line; it may also require construction of booster-pump stations and a water-treatment plant. Either delivery system would be developed by the State or local governmental agency. Water from Topeka is of potable quality, while water from Pomona Lake would have to be treated. The outlying facilities can be served by connecting to the rural water districts that cover all but the southeastern quadrant of the ring. This area and the south cluster can be served by the water system at Vassar State Park or by wells.

The region has several cities within a 1-hour drive of the collider ring as shown in Section 4.2. Together they are able to provide a variety of housing, cultural, educational, and recreational opportunities for temporary and permanent personnel relocating to this area. Additionally, the workforce in these communities will provide some of the professional, technical, and labor support needed during the construction and operation of the SSC. Topeka (a 20-minute drive to the north) will serve as the major service center for the SSC.

The transportation network available on and around the site provides quick, convenient access to the various facilities dispersed around the ring, as well as links to the region, the United States, and the world. Kansas

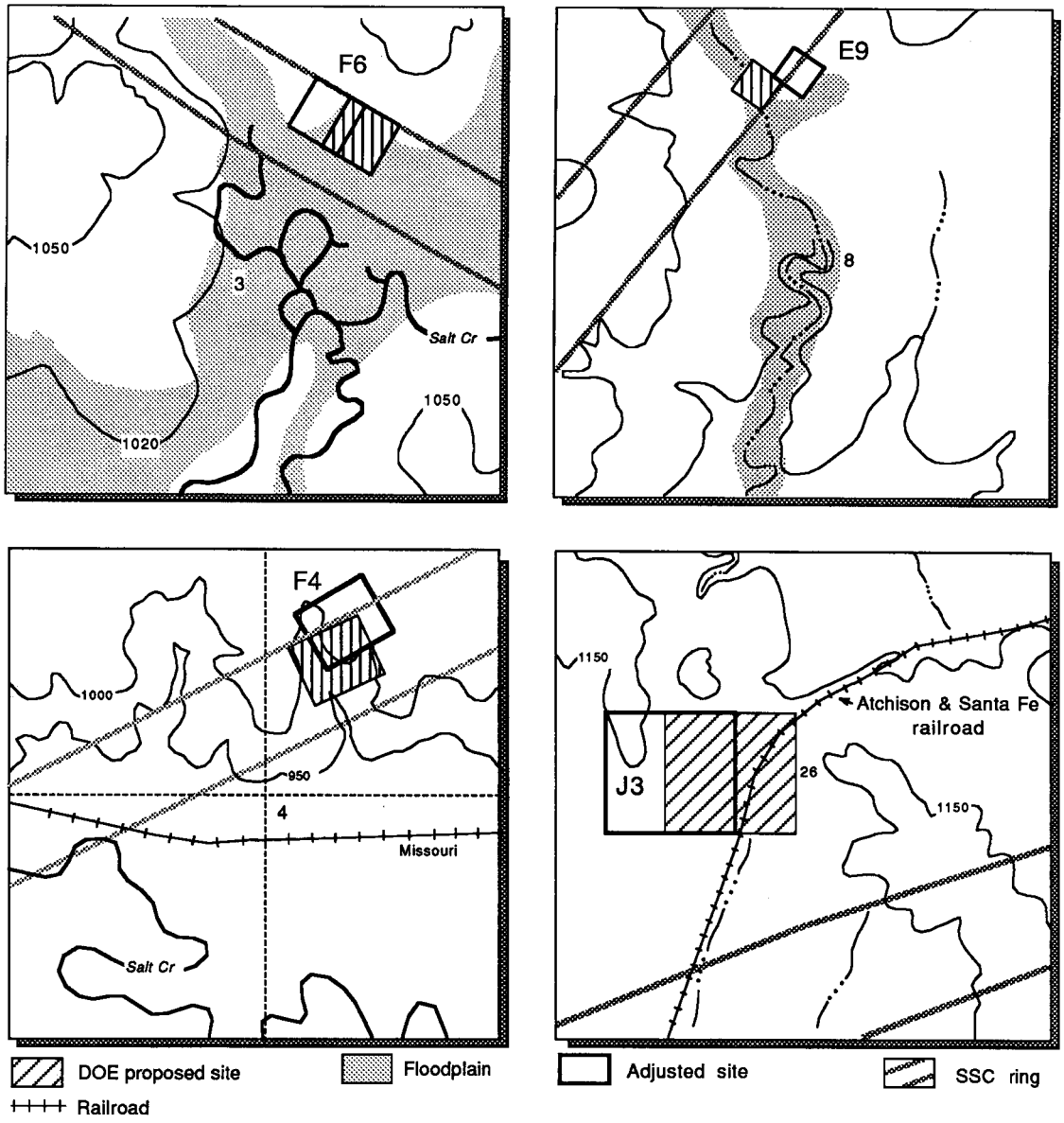


FIGURE 6.5—LOCATION OF SITE CHANGES MADE IN KANSAS PROPOSAL TO ADD GREATER DEVELOPMENT FLEXIBILITY.

City International Airport (KCI), 90-minutes driving time from the campus, provides regularly scheduled, direct passenger service to all major metropolitan areas. Forbes Field has the capacity to land the largest aircraft in service. As noted in Section 4.1, the long runways and light traffic at Forbes may prove to be an asset, allowing convenient airfreight or charter delivery of materials and equipment to the collider.

The region and the site are well served by a network of highways and local roads. Interstates 70 and 35 pass through this area. As illustrated in section 4.2, each is linked directly to the collider ring by U.S. Highway 75, which provides a four-lane connection to I-470 and Topeka to the north and two-lane service to I-35 to the south. A divided, four-lane parkway (4 miles long) will be constructed by the State of Kansas to complete the four-lane service between the campus and Topeka. This connection with Topeka (a 20-minute, 15-mile drive) will be the primary access route for the majority of the employees and visitors to the SSC. Those coming from the east, south, and west will arrive via U.S. Highway 56, which also connects with I-35 east of the SSC site and the Kansas Turnpike to the west.

Local highways and roads provide excellent service to the outlying facilities. U.S. Highway 75 links the campus and north cluster directly to the south cluster. The network of local roads (and the presence of abandoned surface mines and quarries) makes it possible to dispose of all spoils from construction of the tunnels within 7-mile haul distances as shown in Section 3.5. Adding access roads totaling about 4 miles in length makes it possible to link all SSC facilities outside of the campus and injector areas.

Railroad service crosses the site at several points as shown in Section 4.2. The Santa Fe crosses the northwest arc near abort/external beam access J-3, service area F-9, and intermediate access point E-9. The Missouri Pacific, running east-west through the site, crosses the east end of the south cluster near service area F-4 and passes midway between service area F-7 and intermediate access point E-7. A branch of this line running north passes 3 miles west of the campus and crosses the north cluster west of intermediate access point E-1. Much of the terrain traversed by these rail lines is nearly level and open, making it possible to construct sidings at several locations.

All facilities are located outside of communities on gently sloping, open farmland. Agriculture is the dominant land use in this area, and construction in this sparsely built-up landscape can be accomplished with minimum cost of demolition, grading, and sediment/erosion control.

Strowbridge Reservoir, the public water supply for Carbondale, is located in the immediate vicinity of the campus—the SSC's most intensely developed area at the surface. Runoff from the entry parkway and the buildings and parking areas in the campus could impact Strowbridge Reservoir and thus the town's water supply. To reduce this risk, sediment traps will be built for use during construction. These will be reshaped after construction and used as stormwater-retention basins and small-lake features as delineated on the site plan in Section 6.1. Approximately 2,200 acres of cropland and pasture in this watershed will potentially be idled and restored to native grassland. This should reduce the amount of agriculturally related pollutants that enter the lake and improve the water quality of the lake.

Should these measures fail to maintain appropriate water-quality standards, the City of Carbondale has agreed to abandon the lake as a source of potable water and to establish a new source elsewhere. This agreement removes any restrictions the presence of Strowbridge Reservoir may have on the construction and operation of the SSC. The site plan, in fact, recognizes the reservoir as an asset. Located as it is, the reservoir becomes a major focal point for the SSC and (at DOE's discretion) potentially the focal point for additional ancillary facilities focusing on staff and visitors services.

According to a U.S. Government Land Office survey map dated November 1857, the Santa Fe Trail passed through the southern portion of tracts A and C in areas of little or yet undetermined proposed development. The map shows the trail running easterly from a point near the southern entrance to the campus. However, the only visible evidence of the trail is located outside of proposed SSC property, south of U.S. Highway 56. Therefore, the prior existence of the trail will not restrict development and use of the site. As described in Section 5.7, no properties listed on the National Register of Historical Places are found at the SSC site; however, five barns and three farmsteads have been identified as potentially eligible for listing on the National Register.

A cemetery is located in the HEB area. The State of Kansas is prepared to acquire and move the cemetery, furnishing DOE with unconditional fee title to Area B. However, the State suggests the alternative of allowing the cemetery to remain in its current location, with a limited and controlled access road. The cemetery should have minimal impact on the construction and operation of the SSC.

6.2 REAL ESTATE ACQUISITION PLAN

6.2.1 Scope of Acquisition

6.2.1.1 Types of Estate

The interests in land to be acquired for the project are summarized as follows:

Nature of Estate	Acres
Fee Simple	10,049
Stratified Fee	8,231
Surface Utility Easement	374
Access Road Easement	2
Highway Easement	88
Mobilization/Storage Easement	160

In addition to the area identified by the ISP (Invitation for Site Proposals for the SSC, Department of Energy), for fee simple acquisition, 1,020 acres of spoil-pit and mobilization/storage areas and 1,166 acres of additional available land for project development are identified for fee simple acquisition above.

The location of these estates is shown on Plate 6.2 (in back envelope).

6.2.1.2 Number of Parcels and Ownerships

A total of 409 tracts, including those tracts of additional available land identified in Section 6.2.4. of this proposal, involving 303 ownerships will be acquired for the project. The location of these tracts with reference to each estate is depicted on Plate 6.2 (in back envelope). The numerical distribution of tracts around the collider ring is depicted on Plate 6.3 (in back envelope).

6.2.1.3 Land Owned by Governments

Strowbridge Reservoir is the municipal water supply for the City of Carbondale, Kansas, pursuant to

Certificate of Appropriation, Application No. 9047, Priority Date October 8, 1962 (appendix 1, volume 6). This reservoir is a 3,112-acre-foot impoundment. The underlying fee is owned variably by the City of Carbondale and Carbondale Development Company. Flowage easements above the permanent impoundment are owned by the city and the development company.

A substitute water supply will be provided to the City of Carbondale if the SSC is awarded to Kansas, and the water quality of Strowbridge Reservoir is degraded during the construction of SSC facilities. The City Council has by letter dated June 15, 1987, expressed its willingness to accommodate the SSC by accepting a substitute water supply (appendix 2, volume 6).

Acquisition of the underlying fee of the lake will be accomplished by purchase or condemnation. The Certificate of Appropriation, which under Kansas law is a property right, will be transferred along with a change of use to the State of Kansas and then to the United States pursuant to K.S.A. 82a-708b (appendix 3, volume 6).

6.2.1.4 Configuration, Acreage, Estates, and Dimensions of Proposed Site

Three maps identified as Plates 6.2 and 6.3 (in back envelope) and Figure 6.6 show the configuration, acreage, estates, and dimensions of the proposed site; the numerical distribution of tracts around the collider ring; and improvements that require relocation or can be used by the SSC and the location of utility lines, both gas and electric, and cemetery which require relocation.

6.2.1.5 Residences and Businesses Requiring Relocation

A total of 67 tracts have residences or agricultural-use buildings which will qualify for relocation assistance. Fifty-nine of these locations include residences. The location of those improvements and the usefulness thereof to the SSC are shown on Figure 6.6.

Nine properties have structures that must be removed for construction of SSC facilities. Six of the nine listed in this category are located in areas A and B.

Thirty-six properties have structures that can be saved and utilized during construction and operation of the SSC. A matrix showing location and possible uses as construction office, security office, staff housing, and storage for maintenance equipment and material has been included in the appendix (appendix 4, volume 6).

Twenty-three properties have structures located outside of the SSC boundaries. These structures are scheduled for acquisition but will be deleted at the election of the landowners. A typical example of this category of relocation-eligible structure is a house located at the surface, above the stratified fee estate. Although the ISP does not require acquisition of these structures, the State will be sensitive to the desires of the landowner with reference to living in a dwelling above the tunnel.

The electric-transmission lines, 345 kV and 115 kV, owned by the Kansas Power and Light Company cross Area B. The company has cooperated with the State of Kansas in making this proposal and has committed to relocation of its line at no cost to the State or the United States. In an agreement between the Kansas Power and Light Company (KPL) and Kaw Valley Electric Cooperative, wherein KPL was designated by the Kansas Corporation Commission as the utility to serve the north side of the project, each utility agreed to relocate its own lines (appendix 5, volume 6), requiring relocation at no cost to the State or United States (Figure 6.6).

Relocation of Ridgeway Cemetery is considered in Section 6.2.3.9. As an alternative, the State of Kansas proposes that the cemetery remain in place with access thereto being limited and controlled. The cemetery is located 3/4 mile east of U.S. Highway 75. Controlled access to the cemetery by existing east/west oriented gravel county road could be maintained without compromising security of the project (Figure 6.2).

Williams Natural Gas Company (Williams) operates two natural gas transmissions in the vicinity of the far cluster. A 26-inch pipeline crosses the far cluster in secs. 9 and 10, T. 17 S., R. 16 E., Osage County. This line will be relocated around the far cluster on the south and east. The 4-inch line will be relocated along U.S. Highway 75 right-of-way across the far cluster. Williams operates a 4-inch line that crosses the fee simple acquisition area in sec. 25, T. 14 S., R. 15 E., Osage County. This line will be relocated along U.S. Highway 75 right-of-way. As an alternative these lines could remain in their present location (Plate 6.2, in back envelope).

The Atchison, Topeka & Santa Fe Railroad crosses the fee simple acquisition area in secs. 34 and 35, T. 14 S., R. 15 E., Osage County. Relocation of this segment of track is feasible. However, the proposed location of J3 was specifically selected with the view that as an alternative the track could be accommodated at its present location (Figure 6.5).

6.2.2 Method of Acquisition

6.2.2.1 Proposed Method of Site Acquisition

Site-acquisition will begin at the time Kansas is selected for the BQL (Best Qualified List). Certificates of Title (C/T) will be ordered for all property identified in Section 6.2.1.1 and depicted in Section 6.2.1.4, with a completion and delivery date for all C/Ts of June 30, 1988. Delivery of the C/Ts for fee simple tracts in areas A, B, and C and the mobilization/storage easement near F4 will receive priority. Fee simple tracts located in the Far

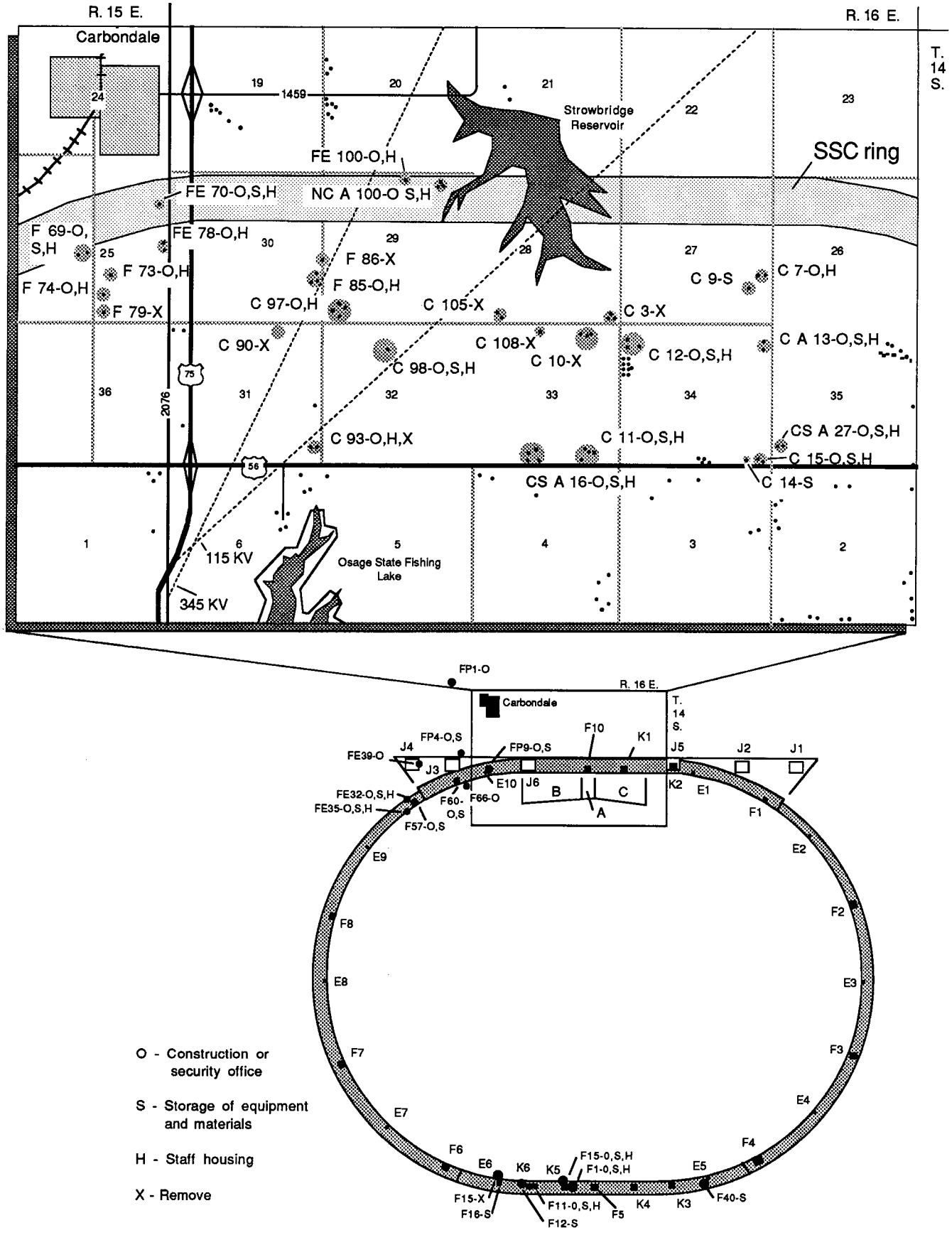


FIGURE 6.6--IMPROVEMENTS THAT REQUIRE RELOCATION OR THAT CAN BE USED BY THE SSC AND THE LOCATION OF UTILITY LINES AND CEMETERY THAT REQUIRE RELOCATION.

Cluster will receive a second-order priority, and stratified fee estate tracts located east and north of the Far Cluster and proceeding for one-quarter of the collider ring together with tunneling-spoils sites near these locations will receive a third priority.

The appraisal process for areas A, B, and C, the Far Cluster, and the mobilization/storage easement will be initiated upon receipt of C/Ts for those areas. Preliminary relocation activities will also commence at this time. These appraisals will be made from April 1, 1988, through June 30, 1988. Appraisals for the stratified fee estates and spoils-disposal sites will begin in July 1988, following designation of Kansas as the preferred site. This process effectively extends the time for site acquisition at only modest expense prior to being awarded the project.

At the conclusion of the appraisal review (appendix 6, volume 6), negotiations will begin by delivery of a letter offering fair market-value (appendix 7, volume 6), for the purchase of Irrevocable Offer to Sell the estates identified above (appendix 8, volume 6). These options will be conditioned upon Kansas being awarded the project and will be accepted immediately following notification of the award.

The appraisal, negotiation, and relocation-asssistance process will then proceed in one-quarter increments, divided equally on each end of the collider ring from the point where acquisition was previously terminated, defined above, until the entire ring is appraised and negotiated together with spoils-disposal sites as those sites become necessary in the tunneling operation. Surface easements and fee owned tracts will be acquired along with that portion of the ring where they are located.

This procedure acquires title to areas A, B, and C on or ahead of the schedule proposed by the ISP. It acquires significantly more than one-quarter of the collider ring for transfer on July 1, 1989.

Condemnation for areas A, B,and C, the Far Cluster, and the first quarter of the collider ring not optioned by the acceptance of Irrevocable Offer to Sell will commence on January 25, 1989. A sample form of the Petition is set out in appendix 9, volume 6. This will allow 65 days for condemnation before the April 1, 1989, deadline for Execution of the Offer to Donate Real Property to the Federal Government in the form provided by Appendix G of the ISP. The Kansas condemnation statute provides for quick take with title passing to the condemnor in 50 to 60 days. Commitment for Title Insurance in the amount of the acquisition price with the United States as Purchaser/Donee will be furnished with the offer. The time between execution of the offer and transfer of title to the United States (July 1, 1989) under this plan will be adequate to cure any title defects discovered by Commitment for Title Insurance.

The time advantage gained by this plan when compared to the schedule in the ISP will be maintained by initiating condemnation actions for the tracts not purchased 70 days prior to each subsequent Offer to Donate.

Eighty percent (80 percent) of all tracts can typically be purchased by negotiation in Kansas located projects. Approximately 80 tracts will therefore be acquired in six separate condemnation proceedings. Phase one condemnation will include Osage, Douglas, and Franklin counties while phases 2 through 4 will all be located in Osage County. The number of tracts in any one condemnation will therefore be manageable and not require time extensions or delays that will interfere with the schedule in the ISP. Osage and Franklin counties are in the same judicial district. Continuity of judiciary will expedite condemnations.

Horizontal adjustment in collider location will eliminate a percentage of the ownerships from acquisition. In the event of horizontal adjustment, additional ownerships will be added for acquisition. A relatively high percentage of the ownerships would probably continue to have rights in land acquired for the SSC. Fair-market value of the property before acquisition would therefore remain the same. Adjustment in appraisals would have to be made only for the value of the remainder and impact, if any, of the taking on the remainder.

As potential adjustments in the SSC location are identified by DOE, title search, appraisal, and acquisition by both negotiation and condemnation will be immediately addressed in conformity with the priority list established in this section, or in the priority designated by DOE pursuant to the ISP.

6.2.2.2 Summary of Existing Legislation

The1987 Session Laws of Kansas, Chapter 327, empower the Secretary of Commerce to acquire land and rights in land by purchase, donation, or condemnation for the SSC (appendix 10, volume 6). Acquisition by condemnation will follow the Eminent Domain Procedure Act, K.S.A. 26-501 et seq. (appendix 11, volume 6). This administrative procedure conducted by the District Court, court of general jurisdiction, provides for the District Judge of the County to appoint three disinterested householders in the County to appraise the property at its highest and best use. Just compensation for the estates acquired is defined as the difference in the value of the property immediately before the taking and the value of the remainder immediately after the taking. The procedure typically takes 50 to 60 days for completion and title passes upon deposit of the award of just compensation with the Clerk of the Court for distribution pursuant to order of the Court.

Appeal from the award of just compensation may be taken by either the condemnor or condemnee. A trial de novo before a jury selected from residents of the county or a Special Master will then finally fix just compensation.

Appellate review thereafter is available as a matter of right to the Kansas Court of Appeals and by writ of certiorari to the Kansas Supreme Court.

The technical nature of the project will qualify appeals from the award of just compensation for referral to a Special Master under the provisions of K.S.A. 26-509 (appendix 11, volume 6) and K.S.A. 60-253 (appendix 11, volume 6). While this procedure is not widely used in Kansas, it has unique applicability to the nature and extent of the stratified fee estate, the impact of which is not widely understood as they relate to this project.

Appointment of a Special Master has the added advantage of promoting uniformity of awards at less expense than trial by jury. The procedure is similar to the United States Department of Justice, Lands and Natural Resources Division, Small Tracts Program.

Acquisition of the Ridgeway Cemetery, a cemetery district, is authorized by the 1987 Session Laws of Kansas, Chapter 327 (appendix 10, volume 6), and K.S.A. 17-1350 et seq. (appendix 12, volume 6). Delivery of possession and title to this 10-acre parcel is addressed in Sections 2.4 and 6.2.3.9. of this proposal. The Kansas bid proposes relocation of this small cemetery consistent with the title requirements of the ISP. As an alternative and at the election of DOE, the cemetery will remain at its present location with limited and controlled access.

6.2.2.3 Condemnation Authority

Full condemnation authority exists as discussed in Section 6.2.2.2. No additional legislation is contemplated or necessary.

6.2.2.4 Government-owned Land

No land in the Kansas site is under the administrative control of the United States nor is any land in the site owned by the United States.

6.2.2.5 Assistance from DOE

This section is not applicable to the Kansas proposal.

6.2.2.6 Personnel Acquiring Property

The acquisition team of thirty-six (36) people will be a cooperative effort of Kansas Department of Transportation (KDOT), the principal Kansas agency in acquisition under P.L. 91-646; Kansas City Power and Light (KCPL); Kansas Power and Light (KPL); and Kansas Department of Commerce (KDOC).

The Kansas site is located within 70 miles of the U. S. Army Corps of Engineers, Kansas City District of the Missouri River Division. The KDOC has arranged to contract with recently retired Real Estate Division personnel and others who anticipate retirement from the Corps during year 1987 and first quarter 1988. This group, coupled with KDOT personnel, provide the P.L. 91-646 expertise required by the ISP. Included in the group of retired Corps of Engineers personnel is a former Chief, Real Estate Division; two former Chiefs, Appraisal Branch (one a Member of the Appraisal Institute); appraisers; and a relocation specialist.

Two former Assistant United States Attorneys in charge of the Land and Natural Resources section of the United States Attorney's Office for the District of Kansas will contract as condemnation lawyers. The First Assistant Attorney for the Kansas Department of Transportation will also serve as a condemnation lawyer. The combined experience of these individuals under P.L. 91-646 is 295 years.

On-site negotiations will be conducted by skilled negotiators from KDOT and retired Corps of Engineers personnel experienced in P.L. 91-646 procedure. KCPL and KPL will add expertise in electric-line negotiations. These organizations have negotiation capability in excess of this table of organization. The additional capabilities will be utilized for the project should the need arise.

Acquisition Team

Position	Number	Percent Of Time	P.L. 91-646 Experience
Project Manager	1	100	16 years
Appraisers	8	100	73 years
Review Appraisers	2	100	32 years
Negotiators	8	100	75 years
Closing Attorneys	2	50	10 years
Condemnation	3	1 @ 100	16 years
Attorneys		2 @ 50	13 years
Relocation Specialists	6	100	60 years
Secretaries	6	100	N/A

The proposed acquisition team has vast experience in land acquisition for the three Kansas counties where the SSC is located, including relocation of cemetery property. That acquisition experience includes highways, electric-transmission lines, Pomona Lake, Melvern Lake, and Clinton Lake. The percentage of time the acquisition team will devote to the project is shown in the accompanying table of organization.

6.2.3 Schedule of Acquisition

6.2.3.1 Completion of Appraisal

All tracts required by the SSC will be appraised by June 1, 1989. The process is divided into segments as follows:

Phase I	
Areas A, B and C	June 30, 1988
Far Cluster	June 30, 1988
First Quarter of Ring	September 1, 1988
Phase II	
Second Quarter of Ring	November 1, 1988
Phase III	
Third Quarter of Ring	January 1, 1989
Phase IV	
All Remaining Land	June 1, 1989

6.2.3.2 Completion of Survey

Survey of areas A, B, and C and the Far Cluster will begin immediately following the designation of Kansas as the preferred site for the SSC (July 1988). Kansas Department of Transportation (KDOT) survey crews will be utilized for this purpose.

Survey of the site will be consistent with the priority established in Section 6.2.2.1 or in the priority designated by DOE in ISP Section 2.4. Completion of the survey for each segment of the site will correspond to the execution and delivery of the Offer to Donate Real Property to the Federal government for the segment being offered.

The site will be fully surveyed by January 1, 1990.

6.2.3.3 Receipt of Title Evidence

Certificates of Title from which appraisal and acquisition activity will be generated will be acquired for all tracts by June 30, 1988.

Commitment for Title Insurance insuring title in the name of the United States in an amount equal to the fair-market-value purchase price will be secured consistent with the priority established in Section 6.2.2.1 or in the priority designated by DOE in the ISP Section 2.4. Commitment for Title Insurance will be delivered to the Federal government at the time Kansas executes and delivers the Offer to Donate Real Property to the Federal government for the segment being offered.

Commitment for Title Insurance will be delivered to the Federal government for all tracts by January 1, 1990.

6.2.3.4 Commencement of Negotiations

Negotiations for all tracts will begin consistent with the following schedule. Highway easements, road easements, spoils easements, and utility easements required for each segment of the collider ring will be negotiated with that segment.

Phase I	
Areas A, B, and C	April 1, 1988
Far Cluster	April 1, 1988
First Quarter of Ring	September 1, 1988
Phase II	
Second Quarter of Ring	November 1, 1988
Phase III	
Third Quarter of Ring	January 1, 1989
Phase IV	
All Remaining Land	June 1, 1989

6.2.3.5 Filing of Condemnation Proceedings

Condemnation cases for the four acquisition phases will be filed pursuant to the following schedule:

	Date Filed	Date Completed
Phase I		
Osage County	January 25, 1989	March 31, 1989
Douglas County	January 25, 1989	March 31, 1989
Franklin County	January 25, 1989	March 31, 1989
Phase II		
Osage County	April 21, 1989	June 30, 1989
Phase III		
Osage County	July 22, 1989	September 30, 1989
Phase IV		
Osage County	October 10, 1989	December 30, 1989

Phase IV condemnations have been accelerated on the schedule to accommodate the holiday season.

6.2.3.6 Completion of Acquisition

Acquisition will be completed for each of the four phases of acquisition identified in Sections 2.4 and 6.2.2.1 of this proposal upon completion of condemnation as

indicated in Section 6.2.3.5. The time between the four completion dates and the transfer dates will allow ample time for curative title work, should it be necessary.

6.2.3.7 Completion of Relocation of Residences and Businesses

Sixty-seven (67) tracts improved with residences and/or agricultural outbuildings require relocation assistance. The location of these properties is shown on Figure 6.6. No businesses require relocation assistance. The process of relocation assistance will begin as indicated in Section 6.2.2.1 with the designation of Kansas on the Best Qualified List. Actual acquisition will begin by the exercise of the State's right to purchase under Irrevocable Offers to Sell. Preliminary relocation work consisting of identification of potential relocation property will begin at the time each Irrevocable Offer to Sell is executed, or it is determined that negotiation is unsuccessful. All relocation-assistance-eligible properties are included in Phase I, II, or III acquisition under Section 2.4. Relocation assistance will be complete by April 1, 1990.

6.2.3.8 Completion of Relocation of Roads, Cemeteries, etc.

No roads require relocation. The Kansas Department of Transportation has worked with the several counties and townships having jurisdiction over the roads requiring mitigation prior to construction of the SSC. A schedule of action has been established that results in a completion date of January 1989 (appendix 2, volume 4).

Electric-utility lines are divided into two categories. The electric-service lines to homes and agricultural outbuildings will be removed at the time the properties are acquired, and service is no longer needed. Those service lines will be removed on a schedule consistent with the conveyance and delivery of possession to the United States in Section 2.4. The two major electric-transmission lines traversing area B are owned by the Kansas Power and Light Company and will be relocated by that company. The schedule they have adopted will allow for compliance with Kansas legislation for the siting of high-voltage electric-transmission lines, construction of the line, and removal of the existing 115-kV and 345-kV transmission lines on Area B by October 1, 1989.

The only communication lines requiring treatment under this section are telephone-service lines to homes and agricultural outbuildings. The need for this service will terminate when acquisition is complete. No relocation will therefore be required.

Relocation of Ridgeway Cemetery is also considered in Sections 2.4, 6.2.2.2, and 6.2.3.9. Relocation of this cemetery, at the discretion of DOE, will be completed by October 1, 1989, for conveyance and delivery of possession to the United States.

Williams Natural Gas Company has a 26-inch gas-transmission line that crosses the Far Cluster. A second gas-transmission line crosses the Far Cluster one-quarter mile west of U.S. Highway 75, 1 mile south of Lyndon. A third line crosses the fee simple area 1 mile south of Carbondale at a point three-quarters of a mile from U.S. Highway 75. These lines will be relocated outside the area required to be conveyed in fee simple to the Federal government by July 1, 1989. As an alternative, at the election of DOE, these lines can remain in place.

6.2.3.9 Potential Delays

Ridgeway Cemetery is located in Area B. This 10-acre tract consisting of 1,752 sold grave sites has been located inside the proposed location of the high-energy booster. The cemetery is therefore not likely to be in a construction area. Area B has been moved from Phase II acquisition to Phase I acquisition with condemnation under K.S.A. 26-501 et seq. or relocation under K.S.A. 17-1350 et seq. In either event, the measure of compensation is a substitute facility. Disinterment and reinterment will be supervised by the District Court. Possession of the cemetery grounds will be determined by the physical relocation of all graves and the provision of burial plots for the living owners thereof.

Legal proceedings for acquisition and relocation of the cemetery will commence January 25, 1989, following the award of the project to Kansas. That will allow 248 days for relocation of the cemetery prior to the transfer date provided by Section 2.4. Contract for disinterment and reinterment of all graves will be negotiated at the time Kansas is selected as the preferred site. Notice to proceed thereunder will follow the filing of legal proceedings as soon as authorized by the court to do so.

At the election of DOE, the cemetery may remain with limited and controlled access.

6.2.4 Additional Available Land

Location of the collider ring on a best-fit location from the standpoint of geology, tunneling, regional resources, environment, setting, and utilities has provided 574 acres of additional available land lying between areas A, B, and C and U.S. Highways 56 and 75. An additional 592 acres in secs. 20, 21, 28 and 29, T. 14 S., R. 16 E., Osage County, including Strowbridge Reservoir, have been identified for housing and recreation development incident to the project.

These areas have been included in Sections 6.2.1.1 and 6.2.1.2. The area of additional land is identi-

fied on Figure 6.6. This land will be acquired in the name of the State of Kansas regardless of DOE decision to accept title thereto.

6.3 OTHER INFORMATION

The collider ring is located in Osage, Douglas, and Franklin counties, each of which utilizes zoning regulations to control growth and land use. Agriculture is the dominant land use in this area and, with one exception, the land proposed for the SSC is zoned for agricultural uses. The lone exception occurs where the collider ring crosses south of Carbondale. Here, about 82 acres of the north cluster are in an area zoned for residential development. To date, this area is undeveloped and is likely to remain so because most of this tract has been strip mined.

Although the SSC is located close to Topeka, it lies outside of the major growth corridors of eastern Kansas. Growth around the site has been modest, and based on the small amount of land that has been zoned for residential development around nearby communities, this trend is projected to continue.

The zoning laws in these counties are clearly stated, and the process for approval of zoning changes is straightforward.

Volume 6

Appendix 1—Certificate of Appropriation

THE STATE OF KANSAS

STATE BOARD OF AGRICULTURE
Roy Freeland, Secretary

DIVISION OF WATER RESOURCES
Guy E. Gibson, Chief Engineer

CERTIFICATE OF APPROPRIATION FOR BENEFICIAL USE OF WATER

APPLICATION No. 9047
PRIORITY October 8, 1962

WHEREAS, It has been determined by the undersigned that construction of the appropriation diversion works has been completed, that water has been used for beneficial purposes and that the appropriation right has been perfected, all in conformity with the conditions of approval of the above-numbered application and in conformity with the laws of the State of Kansas,

NOW, THEREFORE, Be It Known that GUY E. GIBSON, the duly appointed, qualified and acting Chief Engineer of the Division of Water Resources of the Kansas State Board of Agriculture, by authority of the laws of the State of Kansas, and particularly K. S. A. 82a-714, do hereby certify that, subject to vested rights and prior appropriation rights, the appropriator is entitled to make use of surface water in Strowbridge Creek to be diverted by means of a dam located in the Northwest Quarter of the Northwest Quarter of the Southeast Quarter (NW¼ NW¼ SE¼) of Section 21, Township 14 South, Range 16 East, Osage County, Kansas, at a maximum rate of 210 gallons per minute (0.47 c.f.s.) and in an amount not to exceed 66.5 million gallons per year (204 acre-feet) for direct municipal use in the City of Carbondale, Kansas, and immediate vicinity and within the boundaries of Rural Water District No. 5, Osage County, Kansas.

All natural flows of Strowbridge Creek not needed to satisfy vested rights and prior appropriation rights may be diverted and accumulated in the Carbondale City Reservoir to a maximum extent of 3,372 acre-feet for subsequent municipal use within the limits authorized herein for direct use.

In Witness Whereof, I have hereunto set my hand at my office at Topeka, Kansas, this 25th day of September, 19 75.

DIVISION OF WATER RESOURCES
GUY E. GIBSON
CHIEF ENGINEER
KANSAS STATE BOARD OF AGRICULTURE

Guy E. Gibson, Chief Engineer
Division of Water Resources
Kansas State Board of Agriculture

STATE OF KANSAS, Shawnee COUNTY, ss.

Be It Remembered, That on this 25th day of September A. D. 1975, before me, the undersigned, a notary public in and for said County and State, came Guy E. Gibson, Chief Engineer, Division of Water Resources of the Kansas State Board of Agriculture, who is personally known to me to be such duly appointed, qualified and acting official, and who is personally known to me to be the same person who executed the within instrument of writing as such official and such person duly acknowledged the execution of the same as such Chief Engineer.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my official seal, the day and year last above written.

SARA ARBAIZA
NOTARY PUBLIC
SHAWNEE COUNTY, KANSAS

Signature: Sara Arbaiza
Sara Arbaiza, Notary Public

My commission expires October 29, 1978.

The appropriation right as perfected is appurtenant to and severable from the land herein described.

The appropriation right shall be deemed abandoned and shall terminate when without due and sufficient cause no lawful beneficial use is made of water under this appropriation for three (3) successive years.

The right of the appropriator shall relate to a specific quantity of water and such right must allow for a reasonable raising or lowering of the static water level and for the reasonable increase or decrease of the stream flow at the appropriator's point of diversion.

WATER APPROPRIATION CERTIFICATE

No. 5013

STATE OF KANSAS

Application No. 9047

To City of Carbondale.

State of Kansas, ____ County, ss.

Filed for record this ____ day of ____, 19__

at ____ o'clock ____ m. and

recorded in Book ____ Page ____

Fee $ ____

Register of Deeds

Volume 6

Appendix 2—Letter from City of Carbondale

CITY OF CARBONDALE

234 Main Box 70 Carbondale, KS. 66414
913-564-7108

Joe Harkins, Co-Manager
SSC Project
Kansas Department of Commerce
400 W. 8th St. 5th Floor, Suite 500
Topeka, Ks 66603

Dear Mr. Harkins:

This letter confirms the discussions of the City Council of Carbondale, Kansas and the Kansas Department of Commerce concerning the Superconducting Super Collider Project and the Strowbridge Reservoir.

We understand the development of the project has the potential to interfere with the continued use of the Reservoir as a public water supply source.

We also understand there are several alternative water supply sources available to the City of Carbondale if use of Strowbridge Reservoir ceases.

Because of the general benefits to the community assoiciated with the SSC Project and the availability of the alternative water supply sources, the City of Carbondale is willing to abandon the use of the reservoir as a public water supply source if Kansas is selected as the host state and the subsequent development of the SSC Project causes the reservoir to become unusable for such purpose in the future.

We further understand the State is willing to asume ownership of the reservoir if it is abandoned as a public water supply source. We understand the State is willing to maintain the lake and assure continutation of the fish, wildlife, and recreation benefits now realized from this lake if ownership passes to the state.

Sincerely,

Mayor — date 6/15/87

Councilmember — date _____

Councilmember — date 6/15/87

Council member — date 6/15/87

Councilmember — date 6/15/87

Councilmember — date 6/15/87

Volume 6

Appendix 3—K.S.A. 82a-708b

section for the appropriate category of acre feet in accordance with the following:

Acre Feet	Fee
0 to 100	$100
101 to 320	$150
More than 320	$150 + $10 for each additional 100 acre feet or any part thereof

(c) Except as otherwise provided in subsection (d), each application for a permit to appropriate water for storage, except applications for permits for domestic use, shall be accompanied by an application fee fixed by this section for the appropriate category of storage-acre feet in accordance with the following:

Storage-Acre Feet	Fee
0 to 250	$100
More than 250	$100 + $10 for each additional 250 storage-acre feet or any part thereof

(d) For any application for a permit to appropriate water, except applications for permits for domestic use, which proposes to appropriate by both direct flow and storage, the fee charged shall be the fee under subsection (b) or subsection (c), whichever is larger, but not both fees.

(e) All fees collected by the chief engineer pursuant to this section shall be remitted to the state treasurer as provided in K.S.A. 82a-731 and amendments thereto.

History: L. 1957, ch. 539, § 3; L. 1973, ch. 414, § 1; L. 1982, ch. 4, § 17; L. 1985, ch. 339, § 1; July 1.

Law Review and Bar Journal References:

"Legal Aspects of Water Storage in Federal Reservoirs in Kansas," John C. Peck, 32 K.L.R. 785 (1984).

"The Parting of the Waters—The Dispute Between Colorado and Kansas Over the Arkansas River," Mark J. Wagner, 24 W.L.J. 99 (1984).

82a-708b. Same; applications to change place of use; appeal from decisions of chief engineer; fee. (a) Any owner of a water right may change the place of use, the point of diversion or the use made of the water, without losing priority of right, provided such owner shall: (1) Apply in writing to the chief engineer for approval of any proposed change; (2) demonstrate to the chief engineer that any proposed change is reasonable and will not impair existing rights; (3) demonstrate to the chief engineer that any proposed change relates to the same local source of supply as that to which the water right relates; and (4) receive the approval of the chief engineer with respect to any proposed change. The chief engineer shall approve or reject the application for change in accordance with the provisions and procedures prescribed for processing original applications for permission to appropriate water. If the chief engineer disapproves the application for change, the rights, priorities and duties of the applicant shall remain unchanged. Any person aggrieved by an order or decision by the chief engineer relating to an application for change may appeal to the district court in the manner prescribed by K.S.A. 82a-724 and amendments thereto.

(b) Each application to change the place of use, the point of diversion or the use made of the water under this section shall be accompanied by a fee of $50. All fees collected by the chief engineer pursuant to this section shall be remitted to the state treasurer as provided in K.S.A. 82a-731 and amendments thereto.

History: L. 1957, ch. 539, § 4; L. 1982, ch. 4, § 18; L. 1985, ch. 339, § 2; July 1.

82a-711. Applications for permits to appropriate water; duties of chief engineer as to applications. (a) If a proposed use neither impairs a use under an existing water right nor prejudicially and unreasonably affects the public interest, the chief engineer shall approve all applications for such use made in good faith in proper form which contemplate the utilization of water for beneficial purpose, within reasonable limitations except that the chief engineer shall not approve any application submitted for the proposed use of fresh water in any case where other waters are available for such proposed use and the use thereof is technologically and economically feasible. Otherwise, the chief engineer shall make an order rejecting such application or requiring its modification to conform to the public interest to the end that the highest public benefit and maximum economical development may result from the use of such water.

(b) In ascertaining whether a proposed use will prejudicially and unreasonably affect the public interest, the chief engineer shall take into consideration:

(1) Established minimum desirable streamflow requirements;

(2) the area, safe yield and recharge rate of the appropriate water supply;

(3) the priority of existing claims of all

Volume 6

Appendix 4—Matrix of Disposition of Structures on SSC Properties

DISPOSITION OF STRUCTURES ON SSC TRACTS

1	2	3	4	5	6	7	8	9	10	11
				STATUS						
Q TY TRACT ID	QU SE SEC TWN RG	BLDG TYPE	BLDGS OUTSIDE FEE AREA	REMOVE	POSSIBLE FUTURE USES					
					CONSTRUCTION PHASE			DURING CONSTRUCTION PHASE		
					CONSTR. OFF.	SECURITY OFF.	STOR. OF EQ. & MAT.	STAFF HOUSE	SECURITY OFF.	STOR. OF MAINT EQ. & MATER.
1 F P 1	S, NW 15 T15S R15E	HR	X							
		O	X							
1 F P 1	, NW 22 T14S R16E	HR	X							
		O	X							
1 C 3	SE 26 T14S R16E	HR		X						
1 C 7	N, SE 27 T14S R16E	HR			X	X		X	X	
		O								X
1 C 9	S, SE 27 T14S R16E	O					X			X
1 C 10	, NE 33 T14S R16E	HR		X						
		O		X						
1 C 11	, S 33 T14S R16E	HR			X	X		X	X	
		O					X			X

LEGEND

Q - Quadrant
TY - indicates the use of the area on the SSC ring in which the tract falls

QU-SE - Quarter Section
SEC - Section
TWN - Township
RG - Range

BLDG TYPE - Building Type
HR - House
O - Other (farm building, barn, etc.)

1	2	3	4	5	6	7	8	9	10	11
				STATUS						
Q TY TRACT ID	QU SE SEC TWN RG	BLDG TYPE	BLDGS OUTSIDE FEE AREA	REMOVE	POSSIBLE FUTURE USES					
					CONSTRUCTION PHASE			DURING CONSTRUCTION PHASE		
					CONSTR. OFF.	SECURITY OFF.	STOR. OF EQ. & MAT.	STAFF HOUSE	SECURITY OFF.	STOR. OF MAINT EQ. & MATER.
1 C 12	NW 34 T14S R16E	HR			X	X		X	X	
		O					X			X
1 C A 13	NE,NE 34 T14S R16E	HR			X	X		X	X	
1 C 14	SE 34 T14S R16E	HR					X			X
1 C 15	SE,SE 34 T14S R16E	HR			X	X		X	X	
		O					X			X
1 CS A 16	SW 34 T14S R16E	HR			X	X		X	X	
		O					X			X
1 FE 24	N 25 T14S R16E	HR	X							
1 F 26	SE 25 T14S R16E	HR	X							
		O	X							

DISPOSITION OF SITES FOR USE ON SSC PROPERTIES

1	2	3	4	5	6	7	8	9	10	11
				STATUS						
Q TY TRACT ID	QU SE SEC TWN RG	BLDG TYPE	BLDGS OUTSIDE FEE AREA	REMOVE	POSSIBLE FUTURE USES					
					CONSTRUCTION PHASE			DURING CONSTRUCTION PHASE		
					CONSTR. OFF.	SECURITY OFF.	STOR. OF EQ. & MAT.	STAFF HOUSE	SECURITY OFF.	STOR. OF MAINT EQ. & MATER.
1 CS A 27	SW,SW 35 T14S R18E	HR			X	X		X	X	
		O								X
1 FE 30	SW 30 T14S R17E	HR	X							
1 FE 33	N, SW 29 T14S R17E	HR	X							
		O	X							
1 FE 39	SE 29 T14S 417E	HR	X							
		O	X							
1 FE 54	N, NE 32 T14S R17E	HR						X	X	
1 FE 56	NW 33 T14S R17E	HR	X							
		O	X							
1 FE 57	NE 33 T14S R17E	HR	X							

1	2	3	4	5	6	7	8	9	10	11
				STATUS						
Q TY TRACT ID	QU SE SEC TWN RG	BLDG TYPE	BLDGS OUTSIDE FEE AREA	REMOVE	POSSIBLE FUTURE USES					
					CONSTRUCTION PHASE			DURING CONSTRUCTION PHASE		
					CONSTR. OFF.	SECURITY OFF.	STOR. OF EQ. & MAT.	STAFF HOUSE	SECURITY OFF.	STOR. OF MAINT EQ. & MATER.
1 FE 67	N, NW 11 T15S R17E	HR	X							
		O	X							
1 FE 91	E, SE 36 T15S R17E	HR	NOT FOUN							
2 FE 8	N 13 T16S R17E	HR	X							
		O	X							
2 FE 16	N, SE 26 T16S R17E	HR	X							
		O	X							
2 F 33	SW 6 T17S R17E	HR	X							
2 F 40	NW 7 T17S R17E	O					X			X
3 F 1	NW 10 T17S R16E	HR			X	X		X	X	
		O					X			X

TABULATION OF STRUCTURES ON AREA PROPERTIES

1	2	3	4	5	6	7	8	9	10	11
				STATUS						
Q TY TRACT ID	QU SE SEC TWN RG	BLDG TYPE	BLDGS OUTSIDE FEE AREA	REMOVE	POSSIBLE FUTURE USES					
					CONSTRUCTION PHASE			DURING CONSTRUCTION PHASE		
					CONSTR. OFF.	SECURITY OFF.	STOR. OF EQ. & MAT.	STAFF HOUSE	SECURITY OFF.	STOR. OF MAINT EQ. & MATER.
3 F 5	NE 9 T17S R16E	HR			X	X		X	X	
		O					X			X
3 F 9	N, NW 9 T17S R16E	HR	X							
3 F 10	E 8 T17S R16E	O	X							
3 F 11	NW 8 T17S R16E	HR			X	X		X	X	
		O					X			X
3 F 12	NW 8 T17S R16E	O					X			
3 F 15	SE 1 T17S R15E	O		X						
3 F 16	NE 12 T17S R15E	O					X			
3 F 18	SW 1 T17S R15E	O	X							
3 F 20	E, SE 2 T17S R15E	HR	X							
		O	X							

[illegible] STRUCTURES IN SITE PROPERTIES

1	2	3	4	5	6	7	8	9	10	11
				STATUS	POSSIBLE FUTURE USES					
					CONSTRUCTION PHASE			DURING CONSTRUCTION PHASE		
Q TY TRACT ID	QU SE SEC TWN RG	BLDG TYPE	BLDGS OUTSIDE FEE AREA	REMOVE	CONSTR. OFF.	SECURITY OFF.	STOR. OF EQ. & MAT.	STAFF HOUSE	SECURITY OFF.	STOR. OF MAINT EQ. & MATER.
3 FE 27	E 3 T17S R15E	HR	X							
		O	X							
3 FE 43	W, SE 29 T16S R15E	HR	X							
		O	X							
3 FE 56	N 18 T16S R15E	HR	X							
		O	X							
4 F P 1	N&SW 23 T14S R15E	HR			X	X			X	
4 F P 4	W, SE 23 T14S R15E	HR			X	X			X	
		O					X			
4 F P 9	SE 25 T14S R15E	HR			X	X			X	
		O					X			X

1	2	3	4	5	6	7	8	9	10	11
				STATUS						
Q TY TRACT ID	QU SE SEC TWN RG	BLDG TYPE	BLDGS OUTSIDE FEE AREA	REMOVE	POSSIBLE FUTURE USES					
					CONSTRUCTION PHASE			DURING CONSTRUCTION PHASE		
					CONSTR. OFF.	SECURITY OFF.	STOR. OF EQ. & MAT.	STAFF HOUSE	SECURITY OFF.	STOR. OF MAINT EQ. & MATER.
4 FE 32	S. SE 33 T14S R15E	HR			X	X		X	X	
		O					X			X
4 FE 35	SE 33 T14S R15E	HR			X	X		X	X	
		O					X			X
4 FE 39	N 28 T14S R15E	HR			X	X			X	
4 F 57	NW 34 T14S R15E	HR			X	X			X	
		O					X			X
4 FE 53	W 28 T14S R15E	HR	X							
		O	X							
4 F 60	SW 28 T14S R15E	HR			X	X		X	X	
		O					X			X
4 F 66	W. SE 28 T14S R15E	HR			X	X		X	X	

DISTRIBUTION OF STRUCTURES ON DSF PROPERTIES

1	2	3	4	5	6	7	8	9	10	11
				STATUS						
Q TY TRACT ID	QU SE SEC TWN RG	BLDG TYPE	BLDGS OUTSIDE FEE AREA	REMOVE	POSSIBLE FUTURE USES					
					CONSTRUCTION PHASE			DURING CONSTRUCTION PHASE		
					CONSTR. OFF.	SECURITY OFF.	STOR. OF EQ. & MAT.	STAFF HOUSE	SECURITY OFF.	STOR. OF MAINT EQ. & MATER.
4 F A 66	SE 26 T14S R15E	HR			X	X		X	X	
4 F 69	SW 25 T14S R15E	HR			X	X		X	X	
		O					X			X
4 FE 70	NE 25 T14S R15E	HR			X	X		X	X	
		O					X			X
4 F 73	SE 25 T14S R15E	HR			X	X		X	X	
4 F 74	SE 25 T14S R15E	HR			X	X		X	X	
4 FE 75	NE,SE 25 T14S R15E	HR			X	X		X	X	
4 F 79	E 25 T14S R15E	HR		X						
4 F 85	SE,NE 30 T14S R16E	HR			X	X		X	X	
4 F 86	SE 30 T14S R16	HR		X						
		O		X						

1	2	3	4	5	6	7	8	9	10	11
				STATUS						
Q TY TRACT ID	QU SE SEC TWN RG	BLDG TYPE	BLDGS OUTSIDE FEE AREA	REMOVE	POSSIBLE FUTURE USES					
					CONSTRUCTION PHASE			DURING CONSTRUCTION PHASE		
					CONSTR. OFF.	SECURITY OFF.	STOR. OF EQ. & MAT.	STAFF HOUSE	SECURITY OFF.	STOR. OF MAINT EQ. & MATER.
4 C 90	NE,NE 31 T14S R16E	O		X						
4 C 92	NW,SE 31 T14S R16E									
4 C 93	SE 31 T14S R16	HR			X	X		X	X	
		O		X						
4 C 97	SW 29 T14S R16	HR			X	X		X	X	
		O								X
4 C 98	N 32 T14S R16E	HR			X	X		X	X	
		O					X			X
4 C A 98	NW,NW 32 T14S R16E	O								
4 FE 100	W, NE 29 T14S R16E	HR			X	X		X	X	
4 NC A 100	W, NE 29 T14S R16E	HR			X	X		X	X	
		O					X			X

DISPOSITION OF DATA FORMS ON SSC MONTHLY

1	2	3	4	5	6	7	8	9	10	11
				STATUS						
QUTY TRACT ID	QU SE SEC TWN RG	BLDG TYPE	BLDGS OUTSIDE FEE AREA	REMOVE	POSSIBLE FUTURE USES					
					CONSTRUCTION PHASE			DURING CONSTRUCTION PHASE		
					CONSTR. OFF.	SECURITY OFF.	STOR. OF EQ. & MAT.	STAFF HOUSE	SECURITY OFF.	STOR. OF MAINT EQ. & MATER.
4 C 105	SW 28 T14S R16E	HR		X						
		O		X						
4 C 108	NE 33 T14S R163	HR		X						

SUMMARY

Number of tracts outside fee area - 21
Number of tracts with buildings to be removed - 9
Number of tracts with building which may be used as construction/secturity offices - 32
Number of tracts with buildings which may be used as staff housing - 27
Number of tracts with buildings which may be used as storage facilities - 25

See Figure 6.6 (Location of Structures Eligible for Relocation Assistance and/or Potential SSC Use) for tract locations on the proposed Kansas SSC site.

Volume 6

Appendix 5—Agreement Between Kansas Power and Light Company and Kaw Valley Electric Cooperative

BEFORE THE STATE CORPORATION COMMISSION

OF THE STATE OF KANSAS

Before Commissioners: Keith R. Henley, Chairman
Rich Kowalewski
Margalee Wright

In the Matter of the Application of THE KANSAS POWER AND LIGHT COMPANY and KANSAS CITY POWER & LIGHT COMPANY for a Certificate of Convenience and Authority to transact the business of electric utilities to the Superconducting Super Collider.	DOCKET NO. 156,009-U 87-KPLE-434-C

ORDER

The above-captioned matter comes before the State Corporation Commission of the State of Kansas on an application for a Certificate of Convenience to provide electric service to the Superconducting Super Collider filed by Kansas Power and Light Company and Kansas City Power and Light Company. Having reviewed the application and all pleadings in this matter, being duly advised in the premises, and familiar with its files and records, the Commission finds and concludes as follows:

1. On May 19, 1987, Kansas Power and Light Company and Kansas City Power and Light Company filed an application with the Commission seeking a certificate to provide electric service to the Superconducting Super Collider. Kansas City Power and Light Company requested that its existing service rights to the area serving the south campus of the proposed Superconducting Super Collider site be affirmed. Kansas Power and Light Company stated that it and Kaw Valley Electric Cooperative held certificates to the service area in which the north campus is proposed to be located if Kansas is selected as the site for the Superconducting Super Collider project. In its application, KPL and KCPL asserted that the opportunities for the State of Kansas of being awarded the SSC project would be enhanced if KPL were awarded the service rights presently held by Kaw Valley and if KCPL's existing service rights were affirmed. KPL acknowledged Kaw Valley's right to

compensation pursuant to Section 4(c) of Senate Bill 430 if its service rights were terminated and awarded to KPL. KCPL and KPL also requested permission to construct necessary transmission lines. KCPL set out a description of the territory through which the transmission line would need to be constructed. Specifically, KCPL seeks transmission rights for a 161 KV line from Wolf Creek Generating Station located in Coffey County, Kansas, north through Coffey County and Osage County to a point located in Section 10, Township 17S, Range 16E, Osage County, Kansas, for service to the SSC project; thence east through Osage County and Franklin County to Applicant's south Ottawa substation located at Ottawa, Franklin County, Kansas.

2. On May 29, 1987, the Commission issued an order setting the matter of Kansas Power and Light's and Kansas City Power and Light's application for a certificate to provide electric service to the Superconducting Super Collider for hearing. The Commission's order scheduled the hearing for June 9, 1987, and set out a schedule for prefiling of testimony.

3. The following parties intervened in the proceeding: Kaw Valley Electric Cooperative Association, Centel Corporation and Empire District Electric Company, Kansas Electric Power Cooperative, and Kansas Gas and Electric Company.

4. Testimony was filed as required by the Commission by Kansas Power and Light Company, Kansas City Power and Light Company, Kaw Valley Electric Cooperative, Kansas Gas and Electric Company and Terry Smith on behalf of the team responsible for the State's proposal to obtain the Superconducting Super Collider.

5. A prehearing conference was held on June 8, 1987. At that prehearing conference the parties determined the order of witnesses and of cross-examination but were unable to resolve any of the issues.

6. At 9:00 a.m. on June 9, 1987, all parties were present for the hearing as scheduled. In lieu of commencing the hearing,

the parties adjourned to a separate room and discussed the issues. Specifically the issue of whether Kaw Valley or Kansas Power and Light Company should be the lead utility for the north campus was discussed. At that meeting, the parties were able to reach agreement on all issues affecting the State's proposal on utility service with respect to the Superconducting Super Collider. It was determined that Kansas Power and Light Company would be designated as the lead utility for the north campus and the Kansas City Power and Light Company would be the designated lead utility for the south campus. In the negotiations between the parties, it was determined that certification would not be granted in such a manner as to alter territorial boundaries. Rather Kansas Power and Light Company would be authorized to serve the Superconducting Super Collider facility at the north campus substation, but Kaw Valley would provide service to any other customers in its certificated territory. The parties drafted a Stipulation to which all agreed.

7. After agreeing on the Stipulation, a hearing was held on the record. At the hearing, the following attorneys entered their appearances: John Rosenberg and Kent Weatherby on behalf of Kansas Power and Light Company; Pat Salsbury and Mark English on behalf of Kansas City Power and Light Company; James M. Caplinger and James M. Caplinger, Jr., on behalf of Kaw Valley Electric Cooperative Association; James G. Flaherty, on behalf of Centel Corporation and Empire District Electric Company; Harold L. Haun, on behalf of Kansas Electric Power Cooperative; Jerry R. Deaver, on behalf of Kansas Gas and Electric Company; and Frank Caro, Jr., and Eva Powers on behalf of the Commission staff and the public generally.

8. The Commission found that notice, which had been provided to the parties having electric service territory in the area where the Superconducting Super Collider would be located,

was proper and that the Commission had jurisdiction to hear the matter at the particular time and place.

9. Staff counsel informed the Commission of the Stipulation and stated that Mr. Rosenberg for Kansas Power and Light Company would present it to the Commission. The Stipulation is attached to this order and incorporated herein and made an integral part of this order. The Commission found that the Stipulation satisfactorily resolved all disputes between the parties and expressed its pleasure that the matter had been resolved to everyone's satisfaction. The Commission accepted the Stipulation as entered into by the parties.

10. The issue of Kansas City Power and Light's application to place a 161 KV transmission line was also raised. Staff stated that it recommended that authority for the siting of that transmission line be granted contingent on the filing of an EL form as required for such transmission lines. The Commission finds that the authority should be granted contingent upon compliance with that procedure. Authority for the siting of other necessary transmission lines is also granted contingent on compliance with the Commission's informal procedure.

IT IS, THEREFORE, BY THE COMMISSION ORDERED THAT:

Kansas Power and Light Company's and Kansas City Power and Light Company's application to provide electric service to the Superconducting Super Collider shall be granted as specified in the Stipulation attached to this order and incorporated herein.

The Commission further finds that Kansas City Power and Light Company shall be granted the authority to construct the 161 KV transmission line if Kansas is selected as the site for the Superconducting Super Collider and that similarly authority to construct other necessary transmission lines shall be granted as set out above.

The Commission retains jurisdiction over the parties and the subject matter for the purpose of issuing such further order or orders as may be necessary.

Dated: June 10, 1987

Henley, Chmn.; Kowalewski, Com.; Wright, Com.

ORDER MAILED

JUN 11 1987

Executive Director

Judith McConnell
Executive Director

SEAL

EP:rh

STIPULATION

Docket No. 156,009-U

Kansas Power and Light Company, Kansas City Power and Light Company and Kaw Valley Electric stipulate that the Kansas Corporation Commission can issue an order which provides -

1) The order is predicated upon Kansas being selected as the site for the Superconducting Super Collider.

2) Recognizes the existing certificated areas of Kaw Valley Electric, Kansas Power and Light Company, and Kansas City Power and Light Company. Each company will be responsible for its own relocation.

3) Authorizes the construction and installation of transmission as required to reliably serve the Superconducting Super Collider.

4) Authorizes Kansas Power and Light Company and Kaw Valley Electric to enter into an agreement whereby Kansas Power and Light will purchase from Kaw Valley Electric at a point of delivery to the Superconducting Super Collider, and Kansas Power and Light will sell and deliver power and energy to the Superconducting Super Collider.

5) Kansas Power and Light will be the lead utility for the north side and all information will be provided by Kansas Power and Light and all contact for power and energy will be with Kansas Power and Light.

6) Rates will be developed on a cost of service basis.

7) This agreement constitutes full compensation as contemplated by Senate Bill 430.

STIPULATION - ADDENDUM

Kansas Power and Light shall be designated as the sole retail power supplier to the north side of the Superconducting Super Collider, including all related electric consuming facilities. Kaw Valley will not oppose the construction by Kansas Power and Light of any electric plant used to serve the Superconducting Super Collider, provided that no such facilities shall be used to serve other retail customers in Kaw Valley's certificated area.

Kansas City Power and Light shall be designated as the sole retail power supplier to the south side of the Superconducting Super Collider, including all related electric consuming facilities.

Each utility shall be responsible for removal or relocation of electric facilities within its certificated area. This stipulation shall serve as full compensation, as contemplated by Senate Bill 430, in satisfaction of all claims by the parties hereto.

Kaw Valley will construct, operate and maintain a 230 KV transmission line, at its expense, to a point of delivery to Kansas Power and Light north of the Superconducting Super Collider site and will transmit all power to be delivered by Kansas Power and Light to the Superconducting Super Collider at a rate based upon the cost to Kaw Valley of owning, operating and maintaining the line, but in no event higher than the charge that would apply had Kansas Power and Light built the line, all as authorized by the Kansas Corporation Commission.

Kansas Power and Light reserves the right to construct an additional line to the delivery point for purposes of reliability and system planning. Kaw Valley agrees to transmit, free of charge for the life of its 230 KV line, power and energy used for Kansas Power and Light for system operation other than for service to the Superconducting Super Collider.

Volume 6

Appendix 6—Appraisal Review

DEPARTMENT OF COMMERCE

SUPERCONDUCTING SUPER COLLIDER

APPRAISAL ANALYSIS

(For use by Attorneys and Appraisers)

Analyzed by:_____ Date: _____

Identification of Property (Civil No., Tract No., etc.)

REPORTED VALUES Appraiser		Before Value	After Value	Compensation Take	Damages	Total
(1)_____	Land					
	Imp.					
	Total:					
(2)_____	Land					
	Imp.					
	Total:					
(3)_____	Land					
	Imp.					
	Total:					

INSTRUCTION; Items not applicable, indicate by N/A in appropraite blanks. Check ( ) if answer is affirmative; write (No) if answer is negative. Use reverse side to explain all items marked (No) as necessary.

A. CAPTION (Compare with Condemnation Petition)		Appr. (1)	Appr. (2)	Appr. (3)
a. Project and Parcel No.	Correct?			
b. Owner's Name	Correct?			
c. Legal Description	Correct?			
d. Total Area of Property	Correct?			
e. Area Acquired	Correct?			
f. Area of Remainder	Correct?			

B. EFFECTIVE DATE OF APPRAISAL				
a. Coincides with closing	Yes?			
b. Does not coincide with closing but is satisfactory	Yes?			

C. PURPOSE OF THE APPRAISAL				
a. Definition of value compatible with state law	Yes?			
b. Estate appraised correct	Yes?			
c. Taking accurately defined	Yes?			

D. PREMISE OF THE APPRAISAL

		Appr. (1)	Appr. (2)	Appr. (3)
a. Developes the applicable appraisal techniques	Yes?			
b. Follows the applicable legal rules	Yes?			

E. METHOD OF APPRAISAL

a. Appraisal method and technique compatable with appraisal's				
(a) purpose	Yes?			
(b) premise	Yes?			
b. Before and after approach in partial taking supported	Yes?			
c. Omission of one or more value approaches justified	Yes?			
d. Were improvements and interests (mineral, gas, etc.) evaluated based on their contribution to the whole	Yes?			
e. Salvage value of improvements and growing crop values considered	Yes?			

F. PROPERTY DESCRIPTION

a. Land description - including soil types, topography, etc.	Yes?			
b. Improvements - identified, located and described	Yes?			
c. Minerals, gas, oil, timber and growing crops identified	Yes?			
d. Description of property before and after taking	Yes?			

G. HIGHEST AND BEST USE

a. Set forth and justified	Yes?			
b. Alternatives discussed	Yes?			
c. Highest and best use after the taking set forth and justified	Yes?			

H. MARKET DATA

a. Prior sale of subject property considered	Yes?			
b. Cost data justified and supported	Yes?			
c. Depreciation, including physical, functional and economic obsolescence defined, analyzed and supported	Yes?			
d. Income, expense and capitalization rates analyzed and supported	Yes?			
e. Capitalization technique analyzed and supported	Yes?			

H. Market Data Continued -

		Appr. (1)	Appr. (2)	Appr. (3)
f. Comparable sales verified, described, analyzed and related to subject property	Yes?			
g. All sales reported whether or not comparable	Yes?			

I. DAMAGES AND OFFSETTING BENEFITS

a. Appropriately outlined and discussed	Yes?			
b. Adequately analyzied and supported	Yes?			
c. According to state law	Yes?			

J. CORRELATION AND CONCLUSION

a. Appropriate discussion	Yes?			
b. Conclusion sound and convincing	Yes?			
c. Mathematical computations are correct	Yes?			

K. CERTIFICATION

a. Standard clauses included	Yes?			
b. Effective date of valuation established	Yes?			
c. Appraised values set forth	Yes?			
d. Signed	Yes?			

L. EXHIBITS

a. Appropriate pictures	Yes?			
b. Date of pictures established	Yes?			
c. Map showing subject and comparables	Yes?			
d. Plat plan, survey and map of area	Yes?			

M. QUALIFICATIONS OF APPRAISER

a. In report	Yes?			
b. Well qualified	Yes?			

N. GENERAL

a. Would appraiser be used as witness	Yes?			
b. Does state have other appraisals; if (Yes) explain	Yes?			
c. Are additional appraisals warranted; if (Yes) explain	Yes?			

Volume 6

Appendix 7—Letter Offering Fair-Market Value

Included in the amount of just compensation are values for the property rights actually acquired and $_____ which is a severence damage to the property which will remain in your ownership following this acquisition.

The nature of the estates to be acquired from your property are stated on Attachment A to this letter. To the extent that buildings, structures or other improvements are being acquired they are stated on Attachment B.

The negotiator presenting this letter to you is authorized to offer as just compensation for the acquisition of rights and property outlined by this letter and attachments the full and final sum of $_____. The negotiator is not empowered to offer an amount in excess of that sum but is empowered to negotiate by suggesting counteroffers, as may be appropriate, and to receive and forward for approval any offer to sell which you wish to make.

This acquisition is being conducted pursuant to Public Law 91-646 (Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970) as it has been implemented by the United States Department of Energy regulations, 10 CFR Part 1039 and 51 Federal Register 7000.

We look forward to these negotiations and to a mutually satisfactory conclusion.

Sincerely,

Dear (Landowner)

This letter constitutes the opening of negotiations and the offer of the State of Kansas for the acquisition of (fee simple title) (stratified fee estate) (easements for roadways, spoil banks and utility lines) from your property described as:

The property was appraised by a qualified real estate appraiser who considered the highest and best use for the above described tract is _____. The market data or comparable sales approach to valuation was used to establish fair market value of your property both before this acquisition and the fair market value of the property remaining in your ownership after this acquisition. It is the difference in those two values which constitutes our opinion of just compensation. Those valuations are summarized as follows:

Value Before Acquisition $_____

Value After Acquisition $_____

Just Compensation $_____

Volume 6

Appendix 8—Irrevocable Offers to Sell

IRREVOCABLE

OFFER TO SELL REAL PROPERTY

SUPERCONDUCTING SUPER COLLIDER

FEE SIMPLE TRACT

The undersigned, hereinafter called the Vendor, in consideration of $_____ and of the mutual covenants and agreements herein set forth, offers to sell and convey to the State of Kansas and its assigns, the fee simple title to the following described land, with the building and improvements thereon, and all rights, hereditaments, easements, and appurtenances thereunto belonging, located in the County of _____, State of _____, bounded and described as follows:

subject to the following rights outstanding in third parties:

Excepting and reserving only the following rights and interests in the above described property:

The terms and conditions of this offer are as follows:

(1) The Vendor agrees that this offer may be accepted by the State of Kansas through any duly authorized representative, by delivering, mailing, or telegraphing a notice of

acceptance to the Vendor at the address stated below, at any time within twelve (12) months from the date hereof, whereupon this offer and the acceptance thereof become a binding contract.

(2) The State of Kansas agrees to pay to the Vendor for said land the sum of _____($_____), payable on the acceptance of this offer and approval of the Vendor's title; provided the Vendor can execute and deliver a good and sufficient general warranty deed conveying said land with the hereditaments and appurtenances thereunto belonging to the State of Kansas and its assigne, in fee simple, free and clear from all liens and encumbrances, except those specifically excepted or reserved above, together with all right, title, and interest of the Vendor in and to any streams, alleys, roads, streets, ways, strips, gores, or railroad rights-of-way abutting or adjoining said land.

(3) It is agrees that the State of Kansas will defray the expenses incident to the preparation and recordation of the deed to the State of Kansas and the procurement of the necessary title evidence.

(4) The Vendor agrees that all taxes, assessments, and encumbrances which are a lien against the land at the time of conveyance to the State of Kansas shall be satisfied of record by the Vendor at or before the transfer of title and, if the Vendor fails to do so, the State of Kansas may pay any taxes, assessments, and encumbrances which are a lien against the land; that the amount of any such payments by the State of Kansas shall be deducted from the purchase price of the land; that the Vendor

will, at the request of the State of Kansas and without prior payment or tender of the purchase price, execute and deliver the general warranty deed to the United States and obtain and record such other curative evidence of title as may be required by the State of Kansas.

(5) The Vendor agrees that loss or damage to the property by fire or acts of God shall be at the risk of the Vendor until the title to the land and deed to the State of Kansas have been accepted by the State of Kansas through its duly authorized representative or until the right of occupancy and use of the land, as hereinbelow provided for, has been exercised by the State of Kansas; and, in the event that such loss or damage occurs, the State of Kansas may, without liability, refuse to accept conveyance of the title or it may elect to accept conveyance of title to such property, in which case there shall be an equitable adjustment of the purchase price.

(6) The Vendor agrees that the State of Kansas may acquire title to said land by condemnation or other judicial proceedings, in which event the Vendor agrees to cooperate with the State of Kansas in the prosecution of such proceedings; agrees that the consideration hereinabove stated shall be the full amount of the award of just compensation, inclusive of interest, for the taking of said land; agrees that any and all awards of just compensation that may be made in the proceeding to any defendant shall be payable and deductible from the said amount; and agrees that the said consideration shall be in full satisfaction of any and all claims of the Vendor for the payment

of the right of occupancy and use hereinafter provided for in paragraph 7.

(7) As additional consideration for the payment of the purchase price hereinabove set forth, the Vendor hereby grants to the State of Kansas the right of immediate occupancy and use of the land for any purpose whatsoever from and after the acceptance by the State of Kansas of this offer until such time as said land is conveyed to the State of Kansas and, upon demand, the Vendor will immediately vacate the property and deliver possession to the State of Kansas.

(8) It is agreed that the spouse, if any, of the Vendor, by signing below, agrees to join in any deed to the State of Kansas and to execute any instrument deemed necessary to convey to the State of Kansas any separate or community estate or interest in the subject property and to relinquish and release any dower, curtesy, homestead, or other rights or interests of such spouse therein.

(9) This offer shall be null and void if the United States Department of Energy Project for the Superconducting Super Collider is awarded to any bidder other than the State of Kansas, and Vendor shall be entitled to retain the monetary consideration first stated.

(10) The terms and conditions aforesaid are to apply to and bind the heirs, executors, administrators, successors, and assigns of the Vendor.

(11) All terms and conditions with respect to this offer are expressly contained herein and the Vendor agrees that

no representative or agent of the State of Kansas has made any representation or promise with respect to this offer not expressly contained herein.

Signed, Sealed, and Delivered this _____ day of _____, 19_____.

Witnesses.

_____ _____
Vendor

_____ _____
Spouse of Vendor

_____ _____
Vendor

_____ _____
Spouse of Vendor

Notice of acceptance of this offer is to be sent to:

_____
(Name and Address)

Acceptance to Offer to Sell Real Property

Date:

The offer of the Vendor contained herein is hereby accepted for and on behalf of the State of Kansas.

_____
(Name and Title)

Witness:

_____

IRREVOCABLE

OFFER TO SELL REAL PROPERTY

SUPERCONDUCTING SUPER COLLIDER

STRATIFIED FEE ESTATE

The undersigned, hereinafter called the Vendor, in consideration of $_____ and of the mutual covenants and agreements herein set forth, offers to sell and convey to the State of Kansas and its assigns, the stratified fee simple title to the following described land volume and all rights, easements, and appurtenances thereunto belonging, located in the County of _____, State of _____, bounded and described as follows:

subject to the following rights outstanding in third parties:

Excepting and reserving only the following rights and interests in the above described property:

The terms and conditions of this offer are as follows:

(1) The Vendor agrees that this offer may be accepted by the State of Kansas through any duly authorized represen-

tative, by delivering, mailing, or telegraphing a notice of acceptance to the Vendor at the address stated below, at any time within twelve (12) months from the date hereof, whereupon this offer and the acceptance thereof become a binding contract.

(2) The State of Kansas agrees to pay to the Vendor for said land the sum of _____($_____), payable on the acceptance of this offer and approval of the Vendor's title; provided the Vendor can execute and deliver a good and sufficient general warranty deed conveying said land volume with the appurtenances thereunto belonging to the State of Kansas and its assigne, in fee simple, free and clear from all liens and encumbrances, except those specifically excepted or reserved above.

(3) It is agrees that the State of Kansas will defray the expenses incident to the preparation and recordation of the deed to the State of Kansas and the procurement of the necessary title evidence.

(4) The Vendor agrees that all taxes, assessments, and encumbrances which are a lien against the land at the time of conveyance to the State of Kansas shall be satisfied of record by the Vendor at or before the transfer of title and, if the Vendor fails to do so, the State of Kansas may pay any taxes, assessments, and encumbrances which are a lien against the land; that the amount of any such payments by the State of Kansas shall be deducted from the purchase price of the land; that the Vendor will, at the request of the State of Kansas and without prior

payment or tender of the purchase price, execute and deliver the general warranty deed to the United States and obtain and record such other curative evidence of title as may be required by the State of Kansas.

(5) The Vendor agrees that loss or damage to the estate by acts of God shall be at the risk of the Vendor until the title to the land and deed to the State of Kansas have been accepted by the State of Kansas through its duly authorized representative or until the right of occupancy and use of the land, as hereinbelow provided for, has been exercised by the State of Kansas; and, in the event that such loss or damage occurs, the State of Kansas may, without liability, refuse to accept conveyance of the title or it may elect to accept conveyance of title to such property, in which case there shall be an equitable adjustment of the purchase price.

(6) The Vendor agrees that the State of Kansas may acquire title to said land by condemnation or other judicial proceedings, in which event the Vendor agrees to cooperate with the State of Kansas in the prosecution of such proceedings; agrees that the consideration hereinabove stated shall be the full amount of the award of just compensation, inclusive of interest, for the taking of said land; agrees that any and all awards of just compensation that may be made in the proceeding to any defendant shall be payable and deductible from the said amount; and agrees that the said consideration shall be in full satisfaction of any and all claims of the Vendor for the payment

of the right of occupancy and use hereinafter provided for in paragraph 7.

(7) As additional consideration for the payment of the purchase price hereinabove set forth, the Vendor hereby grants to the State of Kansas the right of immediate occupancy and use of the land for any purpose whatsoever from and after the acceptance by the State of Kansas of this offer until such time as said land is conveyed to the State of Kansas and, upon demand, the Vendor will immediately vacate the estate and deliver possession to the State of Kansas.

(8) It is agreed that the spouse, if any, of the Vendor, by signing below, agrees to join in any deed to the State of Kansas and to execute any instrument deemed necessary to convey to the State of Kansas any separate or community estate or interest in the subject estate and to relinquish and release any dower, curtesy, homestead, or other rights or interests of such spouse therein.

(9) This offer shall be null and void if the United States Department of Energy Project for the Superconducting Super Collider is awarded to any bidder other than the State of Kansas, and Vendor shall be entitled to retain the monetary consideration first stated.

(10) The terms and conditions aforesaid are to apply to and bind the heirs, executors, administrators, successors, and assigns of the Vendor.

(11) All terms and conditions with respect to this

offer are expressly contained herein and the Vendor agrees that no representative or agent of the State of Kansas has made any representation or promise with respect to this offer not expressly contained herein.

Signed, Sealed, and Delivered this _____ day of _____, 19_____.

Witnesses.

_____ _____
Vendor

_____ _____
Spouse of Vendor

_____ _____
Vendor

_____ _____
Spouse of Vendor

Notice of acceptance of this offer is to be sent to:

_____
(Name and Address)

Acceptance to Offer to Sell Real Property

Date:

The offer of the Vendor contained herein is hereby accepted for and on behalf of the State of Kansas.

_____
(Name and Title)

Witness:

_____

IRREVOCABLE

OFFER TO SELL EASEMENT

SUPERCONDUCTING SUPER COLLIDER

The undersigned, hereinafter called the Vendor, in consideration of $_____ and of the mutual covenants and agreements herein set forth, offers to sell and convey to the State of Kansas and its assigns, a permanent and assignable easement for the purpose set forth in Exhibit B, in, upon, over, under, and across that certain tract of land described in Exhibit A, hereto attached and made part hereof.

The terms and conditions of this offer are as follows:

(1) The Vendor hereby agrees that this offer may be accepted by the State of Kansas, through any duly authorized representative, by delivering, mailing, or telegraphing a notice of acceptance to the Vendor at the address stated below, at any time within twelve (12) months from the date hereof, whereupon this offer and the acceptance thereof become a binding contract.

(2) The State of Kansas agrees to pay to the Vendor for said easement and rights the sum of _____ ($_____), payable upon acceptance of this offer and approval of the Vendor's title; provided the Vendor can execute and deliver a good and sufficient general warranty deed of easement and rights to the State of Kansas and its assigns, free and clear from all liens, encumbrances, said conveyance to be subject only to the existing easements and rights set forth in said Exhibit B.

(3) The Vendor agrees to satisfy of record, at or before conveying said easement and rights, such taxes, assessments, and encumbrances which are a lien against the land, as the State of Kansas may require, and, if the Vendor fails to do so, the State of Kansas may pay any taxes, assessments, and encumbrances which are a lien against the land; that the amount of any such payments by the State of Kansas shall be deducted from the purchase price of the easement; that the Vendor will, at the request of the State of Kansas and without prior payment or tender of the purchase price, execute and deliver the general warranty deed of easement to the State of Kansas conveying the easement and rights herein described and obtain and record such other curative evidence of title as may be required by the State of Kansas.

(4) It is agreed that the State of Kansas will defray the expenses incident to the preparation and recordation of the deed to the State of Kansas.

(5) The Vendor agrees that the State of Kansas may acquire title to said easement and rights by condemnation or other judicial proceedings, in which event the Vendor agrees to cooperate with the State of Kansas in the prosecution of such proceedings; agrees that the consideration hereinabove stated shall be the full amount of just compensation, inclusive of interest, for the taking of said easement and rights; agrees that any and all awards of just compensation that may be made in the proceeding to any defendant shall be payable and deductible from

the said amount; and agrees that the said consideration shall also be in full satisfaction of any and all claims of the Vendor for the payment of the right of occupancy and use hereinafter provided for in paragraph (6).

(6) As additional consideration for the payment of the purchase price hereinabove set forth, the Vendor hereby grants to the State of Kansas the right of immediate occupancy and use of the land in which said easement is to be granted for the purpose of exercising any of the rights described in said Exhibit B from and after acceptance by the State of Kansas of this offer until such time as said easement is conveyed to the State of Kansas.

(7) The spouse, if any, of the Vendor, by signing below, agrees to join in and execute the deed fo the State of Kansas.

(8) This offer shall be null and void if the United States Department of Energy Project for the Superconducting Super Collider is awarded to any bidder other than the State of Kansas, and Vendor shall be entitled to retain the monetary consideration first stated.

(9) The terms and conditions aforesaid are to apply to and bind the heirs, executors, administrators, successors, and assigns of the Vendor.

(10) All terms and conditions with respect to this offer are expressly contained herein and the Vendor agrees that no representative or agent of the State of Kansas has made any representation or promise with respect to this offer not expressly contained herein.

Signed, sealed, and delivered this _____ day of _____, 19_____.

Witnesses:

_____ _____

_____ _____

_____ _____

_____ _____

Notice of acceptance of this offer is to be sent to:

_____

(Name and Address)

ACCEPTANCE OF OFFER TO SELL EASEMENT

Date:_____

The offer of the Vendor contained herein is hereby accepted for an on behalf of the State of Kansas.

_____

(Name and Title)

Witness:

_____

IRREVOCABLE

OFFER TO SELL COMBINED ESTATES

SUPERCONDUCTING SUPER COLLIDER

The undersigned, hereinafter called the Vendor, in consideration of $_____ and of the mutual covenants and agreements herein set forth, offers to sell and convey to the State of Kansas and its assigns, the estates described in Exhibit B, in, upon, over, under, and across that certain tract of land described in Exhibit A, hereto attached and made part hereof.

The terms and conditions of this offer are as follows:

(1) The Vendor hereby agrees that this offer may be accepted by the State of Kansas, through any duly authorized representative, by delivering, mailing, or telegraphing a notice of acceptance to the Vendor at the address stated below, at any time within twelve (12) months from the date hereof, whereupon this offer and the acceptance thereof become a binding contract.

(2) The State of Kansas agrees to pay to the Vendor for said estates the sum of _____ ($_____), payable upon acceptance of this offer and approval of the Vendor's title; provided the Vendor can execute and deliver a good and sufficient general warranty deeds to the State of Kansas and its assigns, free and clear from all liens, encumbrances, said conveyance to be subject only to the existing easements and rights set forth in said Exhibit B.

(3) The Vendor agrees to satisfy of record, at or before conveying said estates, such taxes, assessments, and encumbrances which are a lien against the land, as the State of Kansas may require, and, if the Vendor fails to do so, the State of Kansas may pay any taxes, assessments, and encumbrances which are a lien against the land; that the amount of any such payments by the State of Kansas shall be deducted from the purchase price of the estates; that the Vendor will, at the request of the State of Kansas and without prior payment or tender of the purchase price, execute and deliver the general warranty deeds to the State of Kansas conveying the estates herein described and obtain and record such other curative evidence of title as may be required by the State of Kansas.

(4) It is agreed that the State of Kansas will defray the expenses incident to the preparation and recordation of the deed to the State of Kansas.

(5) The Vendor agrees that the State of Kansas may acquire title to said estates by condemnation or other judicial proceedings, in which event the Vendor agrees to cooperate with the State of Kansas in the prosecution of such proceedings; agrees that the consideration hereinabove stated shall be the full amount of just compensation, inclusive of interest, for the taking of said estates; agrees that any and all awards of just compensation that may be made in the proceeding to any defendant shall be payable and deductible from the said amount; and agrees

that the said consideration shall also be in full satisfaction of any and all claims of the Vendor for the payment of the right of occupancy and use hereinafter provided for in paragraph (6).

(6) As additional consideration for the payment of the purchase price hereinabove set forth, the Vendor hereby grants to the State of Kansas the right of immediate occupancy and use of the land in which said estates are to be granted for the purpose of exercising any of the rights described in said Exhibit B from and after acceptance by the State of Kansas of this offer until such time as said estates are conveyed to the State of Kansas.

(7) The spouse, if any, of the Vendor, by signing below, agrees to join in and execute the deed fo the State of Kansas.

(8) This offer shall be null and void if the United States Department of Energy Project for the Superconducting Super Collider is awarded to any bidder other than the State of Kansas, and Vendor shall be entitled to retain the monetary consideration first stated.

(9) The terms and conditions aforesaid are to apply to and bind the heirs, executors, administrators, successors, and assigns of the Vendor.

(10) All terms and conditions with respect to this offer are expressly contained herein and the Vendor agrees that no representative or agent of the State of Kansas has made any representation or promise with respect to this offer not expressly contained herein.

Signed, sealed, and delivered this _____ day of _____, 19_____.

Witnesses:

_____ _____

_____ _____

_____ _____

_____ _____

Notice of acceptance of this offer is to be sent to:

_____

(Name and Address)

ACCEPTANCE OF OFFER TO SELL EASEMENT

Date:_____

The offer of the Vendor contained herein is hereby accepted for an on behalf of the State of Kansas.

_____

(Name and Title)

Witness:

_____

Volume 6

Appendix 9—Sample Petition

IN THE DISTRICT COUNT OF (1) COUNTY, KANSAS

DEPARTMENT OF COMMERCE OF THE STATE OF KANSAS, Acting through Harland E. Priddle, Secretary of Commerce

Plaintiff,

vs.

No._____

(2)

; the unknown heirs, executors, administrators, devisees, trustees, creditors and assigns of each of the defendants as may be deceased; the unknown spouses of the defendants; the unknown lessees of the defendants; the unknown tenants or occupiers of the property in question or any person claiming by, through or under them; the unknown purchasers under contract with the defendants; the unknown officers, successors, trustees, creditors and assigns of such defendants as are existing, dissolved, or dormant corporations; the unknown executors, devisees, trustees, creditors, successors and assigns of such of the defendants as are or were partners or in any partnership; the unknown guardians, conservators and trustees of such of the defendants as are minors or are in anywise under any legal disability; and the unknown heirs, executors, administrators, devisees, trustees, creditors and assigns of any persons alleged to be deceased,

Defendants.

PETITION

Filed Pursuant to Chapter 26

Kansas Statutes Annotated

COMES NOW Harland E. Priddle, Secretary of Commerce, plaintiff herein, and shows to this honorable court the following:

1. Plaintiff is duly authorized by Senate Bill 430, 1987 Session, Kansas Legislature, published and effective as of May 14, 1987, and K.S.A. 26-501 et seq. to bring this action for the purpose of acquiring the estates described herein for the superconducting super collider.

2. Your petitioner further shows this honorable court it is necessary for him to acquire fee simple title to the tracts of land described in Exhibit (X) attached hereto and made a part hereof by reference which exhibit also includes the names and addresses of owners and lienholders of record and persons in possession of such tracts, reserving unto such owners, but subordinating the same to said superconducting super collider project, the oil and gas or other minerals under or in said tracts. Said tracts are depicted on Exhibit (X) attached hereto and made a part hereof by reference.

3. Petitioner further shows this honorable court it is necessary for him to acquire fee simple title to the tracts of land described in Exhibit (X), attached hereto and made a part

hereof by reference, which exhibit also includes the names and addresses of owners and lienholders of record and persons in possession of such tracts, for sites for improvements necessary or incident to the superconducting super collider project. Said tracts are depicted on Exhibit (X) attached hereto and made a part hereof by reference.

4. Petitioner further shows this honorable court it is necessary for him to acquire a stratified fee estate to the tracts of land described in Exhibit (X), attached hereto and made a part hereof by reference, which exhibit also includes the names and addresses of owners and lienholders of record and persons in possession of such tracts, reserving unto such owners, their heirs, assigns or successors, those future damages, if any, that may be suffered from a loss of subjacent support resulting from the construction of the super collider tunnel, which responsibility shall remain in the State of Kansas notwithstanding the alienation of said tracts; and further reserving unto such owners, but subordinating the same to said superconducting super collider project, the oil and gas or other minerals under or in said tracts. Owners shall have no right to penetrate the stratified fee estate for any purpose without written authorization from plaintiff, his successor or assigns.

5. Petitioner further shows this honorable court it is necessary for him to acquire easements for highways, access roads, electric distribution lines, and spoil areas, the exact nature of which together with a tract description are set forth

in Exhibit (X), attached hereto and made a part hereof by reference, which exhibit also includes the names and addresses of owners and lienholders of record and persons in possession of such tracts.

6. Plaintiff further states that after ascertaining that is has the power of eminent domain and that said land is necessary for the purposes hereinbefore set out, which is within its lawful purposes, that this honorable court should appoint three (3) disinterested householders of the County of , State of Kansas, to review and appraise the above-described parcels of land, ordering and directing such appraisers to take an oath to well and truthfully make such appraisal; and that such appraisers should be ordered and directed to give notice of the time and place, when and where such appraisal will be made in the manner required by law, and that said appraisers be directed to report their appraisal of such tracts, under oath, to this honorable court and to file the same with the Clerk of the District Court of , County, Kansas.

WHEREFORE, plaintiff prays for an order finding that the plaintiff has the power of eminent domain; that the taking is necessary for the lawful corporate purposes of the plaintiff and further, that the Court appoint three (3) disinterested householders of County, Kansas, to view and appraise the lots and parcels of land found to be necessary and to determine the damages to the interested parties resulting from

the taking and that the Court fix the time for the filing of the appraisers' report.

DEPARTMENT OF COMMERCE OF
THE STATE OF KANSAS

By: _____

VERIFICATION

STATE OF KANSAS)
) SS.
COUNTY OF)

Harland E. Priddle, of lawful age, being first duly sworn, states that he is Secretary of Commerce of the Department of Commerce of the State of Kansas, plaintiff herein, and that he has read the above and foregoing Petition; that he knows the contents thereof; and that the statements and allegations therein made are true and correct to the best of his knowledge and belief.

_____

Subscribed and sworn to before me this _____ day of _____, 19_____.

_____
Notary Public

My Appointment Expires:

_____

Volume 6

Appendix 10—1987 Session Laws of Kansas, Chapter 327

CHAPTER 327 *

Senate Bill No. 430

AN ACT concerning the superconducting super collider; authorizing the acquisition of real property and interest or rights therein for certain purposes relating thereto; granting power of eminent domain under certain circumstances; granting certain rights to and imposing certain duties upon the secretary of commerce; authorizing entry upon land in certain circumstances; establishing the super collider project fund; authorizing the state corporation commission to determine the telecommunications provider and electric supplier for the superconducting super collider.

Be it enacted by the Legislature of the State of Kansas:

Section 1. (a) The department of commerce, acting through the secretary of commerce, in the name of the state, may acquire fee simple title or easement by gift, purchase, dedication or by the exercise of the right of eminent domain: (1) To, upon or under any lands or interests or rights therein; (2) to water, gravel, stone, sand or other material; (3) to spoil banks, borrow pits or disposal sites; (4) to access ways, to spoil banks or borrow pits or any bed, pit, quarry or other place where gravel, stone, water or other material or substance is located; (5) to access roads or utility easements necessary to serve lands or rights in land so acquired; and (6) to control access to the lands or rights in land so acquired, all in furtherance of the state acquisition of land for the superconducting super collider. The secretary of commerce, in the name of the state, may acquire title to an entire lot, block or tract of land for the superconducting super collider even though such entire lot, block or tract is not immediately needed for such purpose, if the secretary finds that by so doing the interests of the public will be best served, and without limiting the foregoing, the same may be done where uneconomic remnants of land would be left the original owner or where severance or consequential damage to a remainder make the acquisition of the entire lot, block or tract more economical to the state or where requested to do so by the owner of the lot, block or tract of land.

(b) (1) Exercise of the right of eminent domain by the secretary shall be in accordance with and governed by article 5 of chapter 26 of the Kansas Statutes Annotated.

(2) Every petition filed by the secretary to acquire lands or any interest in or title thereto by the exercise of the right of eminent domain shall set forth the extent, quantity and nature of the interest or title to be acquired.

(3) Except as otherwise provided in paragraph (b)(4), the secretary may subordinate but shall not acquire by eminent domain any right, title or interest in or to the oil and gas or other

minerals under or in any lands, and the petition in any condemnation proceedings shall state that right, title or interest in or to such oil and gas or other minerals is not being condemned but that the same may be subordinated to projects in furtherance of the superconducting super collider.

(4) The secretary may acquire by eminent domain the fee simple title to lands when such lands are acquired for sites for improvements necessary or incident to the superconducting super collider.

(c) The secretary may acquire fee simple title or any lesser degree of title, interest or rights in land by purchase, gift, dedication or exercise in the name of the state by the right of eminent domain in furtherance of the state acquisition of land for the superconducting super collider.

(d) The secretary may donate, sell or trade the real estate or any right, title or degree or variety of interest therein which has been acquired in accordance with the provisions of this section to the federal government or any agency thereof or any other person or entity.

(e) The secretary may enter into such contracts and agreements and perform such other duties as may be necessary to carry out the provisions of this section.

(f) The secretary may enter or authorize designees to enter upon any property to make surveys, examinations, investigations and tests and to acquire other necessary and relevant data in contemplation of the acquisition of land or rights in land pursuant to this section. Prior to entering upon any such property the secretary or designee shall first request permission of the landowner. Where consent to do the things authorized in this subsection (f) is not given to the secretary or designee by the owner or occupant of the land involved, the secretary or designee may proceed as authorized after giving 10 days' written notice to landowner or occupant of the secretary's or designee's intention to conduct such surveys, examinations, investigations and tests. Entry upon any property, pursuant to this subsection (f) shall not be considered to be a trespass and no damages shall be recoverable solely because of such entry.

(g) This section shall be part of and supplemental to the provisions of article 50 of chapter 74 of the Kansas Statutes Annotated and acts amendatory of the provisions thereof or supplemental thereto.

Sec. 2. (a) There is hereby established in the state treasury the super collider project fund which shall be administered by the secretary of commerce. All expenditures from such fund shall

be made upon warrants of the director of accounts and reports pursuant to vouchers approved by the secretary of commerce or the secretary's designee.

(b) Moneys in the super collider project fund shall be used only for the purposes of paying expenses relating to securing the location of the federal superconducting super collider project site in this state.

(c) Upon certification by (1) the federal department of energy to the governor that the state of Kansas has been selected as the official site of the superconducting super collider project and (2) the secretary of commerce to the director of accounts and reports that the unencumbered balance in the super collider project fund is insufficient to pay projected expenditures therefrom, the director of accounts and reports shall transfer an amount equal to the insufficiency from the state general fund to the super collider project fund, with the approval of the state finance council. Transfers pursuant to this subsection are hereby characterized as a matter of legislative delegation and subject to the guidelines prescribed in subsection (c) of K.S.A. 75-3711c and amendments thereto, except that such approval also may be given when the legislature is in session.

Sec. 3. (a) As used in this section: (1) "Telecommunications public utility" means any public utility, as defined in K.S.A. 66-104 and amendments thereto which owns, controls, operates or manages any equipment, plant or generating machinery, or any part thereof, for the transmission of telephone messages, as defined in K.S.A. 66-104 and amendments thereto in or through any part of Kansas.

(2) "Commission" means the state corporation commission.

(3) "Superconducting super collider project" means the United States department of energy particle accelerator facility.

(b) (1) This section recognizes the importance of the superconducting super collider project to Kansas' future economic development and thereby endeavors to enhance Kansas' opportunity of being awarded such a project.

(2) Subject to the provisions of this section, the commission shall have the authority upon application by a telecommunications public utility, to determine the telecommunications public utility to be responsible for providing all telecommunications service to the superconducting super collider project.

(c) (1) In determining which telecommunications public utility shall provide service to the superconducting super collider project, the commission shall select a telecommunications public utility which provides service in the territory where the

switch for the superconducting super collider project shall be located.

(2) The commission shall also ascertain that the telecommunications public utility selected is able to meet the specifications of the superconducting super collider project.

Sec. 4. (a) As used in this section: (1) "Electric transmission lines" means any line or extension of a line which is at least five miles in length and which is used for the bulk transfer of 230 kilowatts or more of electricity.

(2) "Retail electric supplier" means any person, firm, corporation, municipality, association or cooperative corporation engaged in the furnishing of retail electric service.

(3) "Certified territory" means an electric service territory certified to a retail electric supplier pursuant to K.S.A. 66-1,170 *et seq.* and amendments thereto.

(4) "Superconducting super collider project" means the United States department of energy particle accelerator facility.

(b) (1) This section recognizes the importance of the superconducting super collider project to Kansas' future economic development and thereby endeavors to enhance Kansas' opportunity of being awarded such project.

(2) Subject to the provisions of this section, the state corporation commission shall have the authority upon application by any retail electric supplier or group of suppliers, to determine the electric supplier or suppliers to be responsible for providing service to the superconducting super collider, including the termination of service rights and awarding of such service rights to another retail electric supplier.

(c) (1) Fair and reasonable compensation shall be paid to the terminated retail electric supplier by the supplier subsequently authorized to provide electric service. Such amount shall be an amount mutually agreed upon by the affected parties or the sum of the following:

(A) The depreciated replacement cost for the electric utility facilities in the territory in which the service rights have been terminated. As used in this paragraph, "depreciated replacement cost" means the original installed cost of the facilities, adjusted to present value by utilizing a nationally recognized index of utility construction costs, less accumulated depreciation based on the book depreciation rates of the selling utility as filed with and approved by the state corporation commission, which are in effect at the time of acquisition;

(B) all reasonable and prudent costs of detaching the electric system facilities to be sold and all reasonable and prudent costs

of reintegrating the remaining electric system facilities of the retail electric supplier whose service rights are terminated;

(C) an amount equal to 100% of the gross revenues attributable to the existing customers in the terminated territory during the 12 months next preceding the date of termination of the service rights; and

(D) an amount equal to the state and federal tax liability created by the taxable income pursuant to the provisions of this paragraph and paragraphs (A), (B) and (C) by the retail electric supplier whose service rights are terminated, calculated without regard to any tax deductions or benefits not related to the sale of assets covered herein.

(2) In the event that the parties are unable to agree upon an amount of compensation to be paid pursuant to subsection (c)(1), after 60 days following the date of termination of service rights either party may apply to the state corporation commission for determination of compensation. Such determination shall be made by the corporation commission within 60 days of such application.

(d) This section shall supersede those relevant portions of K.S.A. 66-1,170 *et seq.* and K.S.A. 66-1,177*et seq.*, and amendments thereto.

Sec. 5. This act shall take effect and be in force from and after its publication in the Kansas register.

Approved May 11, 1987.

Published in the *Kansas Register* May 14, 1987.

Volume 6

Appendix 11—Eminent Domain Laws

celed and stricken from the tax rolls, and the county clerk and the county treasurer of such county shall correct their records to conform thereto and the county clerk shall notify the taxing authorities of any district in which such real estate, or any part thereof, is situated of such corrections.

History: L. 1955, ch. 434, § 1; June 30.

Revisor's Note:
"Preamble to this act," see L. 1955, ch. 434.

Article 3.—CONDEMNATION OF LAND POSSESSING HISTORICAL INTEREST

Revisor's Note:
New eminent domain procedure act, see 26-501 et seq.

Cross References to Related Sections:
Condemnation of lands under jurisdiction and control of state historical society, see 75-2714.

26-301.
History: L. 1921, ch. 271, § 1; R. S. 1923, 26-301; Repealed, L. 1974, ch. 364, § 40; Jan. 13, 1975.

CASE ANNOTATIONS

1. Land of historical interest taken by state is for public use. State, *ex rel.*, v. Kemp, 124 K. 716, 261 P. 556. Affirmed: 278 U.S. 192, 49 S.Ct. 160, 73 L.Ed. 259.

2. Cited in discussing various eminent domain statutes (dissenting opinion). Moore v. Kansas Turnpike Authority, 181 K. 841, 850, 317 P.2d 384.

26-302.
History: L. 1921, ch. 271, § 2; R. S. 1923, 26-302; Repealed, L. 1974, ch. 364, § 40; Jan. 13, 1975.

CASE ANNOTATIONS

1. Legislature declared land of historical interest; taken for public use. State, *ex rel.*, v. Kemp, 124 K. 716, 261 P. 556. Affirmed: 278 U.S. 192, 49 S.Ct. 160, 73 L.Ed. 259.

26-303, 26-304.
History: L. 1921, ch. 271, §§ 3, 4; R.S. 1923, 26-303, 26-304; Repealed, L. 1963, ch. 234, § 103; Jan. 1, 1964.

26-305, 26-306.
History: L. 1921, ch. 271, §§ 5, 6; R. S. 1923, 26-305, 26-306; Repealed, L. 1974, ch. 364, § 40; Jan. 13, 1975.

Article 4.—STONE QUARRIES

26-401. Procedure for taking stones. Whenever in the prosecution of any public works by the state, or in the erection of public buildings under the authority of the state, it shall be necessary to take any stone or stones from any stone quarry for the purpose of erecting such building, the same may be taken and appropriated in the same manner as is provided by K.S.A. 26-501 to 26-516, inclusive.

History: L. 1865, ch. 80, § 1; G.S. 1868, ch. 106, § 1; R.S. 1923, 26-401; L. 1963, ch. 234, § 75; Jan. 1, 1964.

Research and Practice Aids:
Eminent Domain⇒45.
C.J.S. Eminent Domain § 65 et seq.

26-402. Damages paid by contractor. The contractor or contractors for such works shall in all cases pay the damages which shall be assessed.

History: L. 1865, ch. 80, § 2; Feb. 22; G.S. 1868, ch. 106, § 2; R.S. 1923, 26-402.

Article 5.—PROCEDURE ACT

Cross References to Related Sections:
Constitutional provisions relating to right to exercise eminent domain by certain corporations, see Kan. Const., article 12, § 4.
Condemnation of lands under jurisdiction and control of state historical society, see 75-2714.

Law Review and Bar Journal References:
1963 act explored and analyzed, Marion Beatty, 32 J.B.A.K. 125 (1963).
"Comments on Practice and Procedure in Eminent Domain," Raymond L. Spring, 35 J.B.A.K. 7 (1966).
"Railroad Right of Way: The Real Property Interest in Kansas," Tim Pittman, 25 W.L.J. 327, 336 (1986).

26-501. Eminent domain procedure; venue. (a) The procedure for exercising eminent domain as set forth in K.S.A. 26-501 to 26-516, inclusive, shall be followed in all proceedings. (b) The proceedings shall be brought by filing a verified petition in the district court of the county in which the real estate is situated, except if it be an entire tract situated in two (2) or more counties, the proceedings may be brought in any county in which any tract or parts thereof is situated.

History: L. 1963, ch. 234, § 1; Jan. 1, 1964.

Cross References to Related Sections:
Venue provisions of code of civil procedure, see ¶ (*a*) of 60-601.

Research and Practice Aids:
Eminent Domain⇒173, 191(1).
C.J.S. Eminent Domain §§ 233, 251 et seq.

Law Review and Bar Journal References:
Survey of the law of damages, David Prager, 12 K.L.R. 204 (1963).

CASE ANNOTATIONS

1. Proceedings not judicial in nature until appeal is

filed; injunction landowner's relief. Urban Renewal Agency v. Decker, 197 K. 157, 415 P.2d 373.

2. Public utility, in absence of bad faith, fraud or abuse of discretion, may determine amount of land needed to be taken for its lawful purposes. Shelor v. Western Power & Gas Co., 202 K. 428, 449 P.2d 591.

3. Failure of city to comply with statutory duties (13-1019, 13-1020) does not preclude aggrieved property owner from bringing inverse condemnation action on implied contract. Lux v. City of Topeka, 204 K. 179, 181, 183, 460 P.2d 541.

4. Eminent domain procedure prescribed under this and succeeding section; 68-413 merely designates interests which highway commission may acquire. State Highway Commission v. Moore, 204 K. 502, 504, 464 P.2d 188.

5. Tract of land having leasehold interest dismissed from condemnation proceeding; lessee's rights. State Highway Commission v. Bullard, 208 K. 558, 559, 560, 493 P.2d 196.

6. Eminent domain statute contains no specific provision for allowance of attorney fees and expenses of litigation, other than court costs. Gault v. Board of County Commissioners, 208 K. 578, 493 P.2d 238.

7. Statute contains no authority for allowance of attorney's fee. Schwartz v. Western Power & Gas Co., Inc., 208 K. 844, 847, 849, 494 P.2d 1113.

8. Constitutionality of eminent domain procedure cannot be raised where question moot. Thompson v. Kansas City Power & Light Co., 208 K. 869, 870, 494 P.2d 1092.

9. This and succeeding sections cited in construing section (12-811) concerning purchase of corporate utility plant on expiration of franchise. City of Kiowa v. Central Telephone & Utilities Corporation, 213 K. 169, 172, 515 P.2d 795.

10. Action instituted hereunder; provision for attorney fees under 26-509 remedial; applied to actions pending. Fellers v. State Highway Commission, 214 K. 630, 631, 522 P.2d 341.

11. Act applied; injunction proceeding against electric utility; no abuse of discretion; trial court's findings reviewed and affirmed. Concerned Citizens, United, Inc. v. Kansas Power and Light Co., 215 K. 218, 226, 523 P.2d 755.

12. Proceeding in nature of inverse condemnation; landownership jury question; verdict upheld. Wittke v. Kusel, 215 K. 403, 524 P.2d 774.

13. Proceedings hereunder not forum for litigation of right of exercise of eminent domain or extent thereof. Kansas Gas & Electric Co. v. Winn, 227 K. 101, 103, 106, 605 P.2d 125.

14. Trial court did not abuse discretion in excluding evidence of specific value of leasehold interest but allowing evidence thereof as factor in arriving at value. City of Manhattan v. Kent, 228 K. 513, 618 P.2d 1180.

15. District court without jurisdiction to enlarge appeal period of 26-508. City of Kansas City v. Crestmoore Downs, Inc., 7 K.A.2d 515, 518, 644 P.2d 494 (1982).

16. Condemnor allowed reasonable discretion to determine necessity for taking of land for lawful corporate purposes. Steele v. Missouri Pacific R.R. Co., 232 K. 855, 856, 862, 659 P.2d 217 (1983).

17. Proceedings hereunder not forum for litigation over right to exercise eminent domain or extent thereof. *In re* Condemnation of Land for State Highway Purposes, 235 K. 676, 678, 680, 683 P.2d 247 (1984).

18. Condemnation proceeding does not provide forum for litigating right to exercise eminent domain or extent thereof. Murray v. Kansas Dept. of Transportation, 239 K. 25, 716 P.2d 540 (1986).

26-502. Contents of petition. A petition shall include allegations of (1) the authority for and the purpose of the taking; (2) a description of each lot, parcel or tract of land and the nature of the interest to be taken; (3) insofar as their interests are to be taken (a) the name of any owner and all lienholders of record, and (b) the name of any party in possession. Such petition shall be verified by affidavit. Upon the filing of such petition the court by order shall fix the time when the same will be taken up. No defect in form which does not impair substantial rights of the parties shall invalidate any proceeding.

History: L. 1963, ch. 234, § 2; Jan. 1, 1964.

Research and Practice Aids:

Eminent Domain⇒191(1) et seq.
C.J.S. Eminent Domain § 251 et seq.

CASE ANNOTATIONS

1. Compensation is based on full use condemned as described in condemner's petition and considered by appraisers. Diefenbach v. State Highway Commission, 195 K. 445, 407 P.2d 228.

2. Duty to ascertain parties; owners, lienholders of record and those in possession. Dotson v. State Highway Commission, 198 K. 671, 674, 675, 426 P.2d 138.

3. The only obligation as to parties insofar as the condemner is concerned is to name in the petition the owners and all lienholders of record and the name of any party in possession. Morgan v. City of Overland Park, 207 K. 188, 193, 483 P.2d 1079.

4. Act applied; injunction proceeding against electric utility; no abuse of discretion; trial court's findings reviewed and affirmed. Concerned Citizens, United, Inc. v. Kansas Power and Light Co., 215 K. 218, 226, 523 P.2d 755.

26-503. Eminent domain procedure; notice. The plaintiff shall cause to be published once in a newspaper of general circulation in the county where the lands are situated a notice of the proceeding at least nine (9) days in advance of the date fixed by the court for consideration of the petition and appointment of appraisers, and shall at least seven (7) days before such date mail to each interested party as named in K.S.A. 26-502 and whose address is known or can with reasonable diligence be ascertained a copy of such publication notice and petition

insofar as it relates to his interest. No defect in any notice or in the service thereof shall invalidate any proceedings.

History: L. 1963, ch. 234, § 3; L. 1969, ch. 195, § 1; July 1.

Research and Practice Aids:
Eminent Domain 180, 181.
C.J.S. Eminent Domain §§ 242, 243, 244.

Law Review and Bar Journal References:
Court delay, George S. Reynolds, 12 W.L.J. 16 (1972).
Survey of Kansas law on real and personal property (1965-1969), 18 K.L.R. 427, 436 (1970).

CASE ANNOTATIONS

1. Duty of condemner to ascertain parties. Dotson v. State Highway Commission, 198 K. 671, 674, 426 P.2d 138.
2. Section complied with; condemnees bound by the notice. Unified School District v. Turk, 219 K. 655, 659, 660, 549 P.2d 882.
3. Where appraisers' report filed after date fixed by court, parties have 30 days thereafter to appeal. City of Shawnee v. Webb, 236 K. 504, 505, 507, 694 P.2d 896. (1985).

26-504. Same; findings; order appointing appraisers; duties; appeals to supreme court, when. If the judge finds from the petition: (1) the plaintiff has the power of eminent domain; and (2) the taking is necessary to the lawful corporate purposes of the plaintiff, he shall enter an order appointing three (3) disinterested householders of the county in which the petition is filed to view and appraise the value of the lots and parcels of land found to be necessary, and to determine the damages to the interested parties resulting from the taking. Such order shall also fix the time for the filing of the appraisers' report, and such time for filing shall not be later than twenty (20) days after the entry of such order: *Provided*, For good cause shown, the court may extend the time for filing by a subsequent order. The granting of an order determining that the plaintiff has the power of eminent domain and that the taking is necessary to the lawful corporate purposes of the plaintiff shall not be considered a final order for the purpose of appeal to the supreme court, but an order denying the petition shall be considered such a final order.

Appeals to the supreme court may be taken from any final order under the provisions of this act. Such appeals shall be prosecuted in like manner as other appeals and shall take precedence over other cases, except cases of a like character and other cases in which preference is granted by statute.

History: L. 1963, ch. 234, § 4; Jan. 1, 1964.

Research and Practice Aids:
Eminent Domain 228, 234(5), 238(2).
C.J.S. Eminent Domain §§ 293, 303, 350.

CASE ANNOTATIONS

1. Determination of necessity and authority inquest only; injunction landowner's relief. Urban Renewal Agency v. Decker, 197 K. 157, 158, 415 P.2d 373.
2. Applied; dismissal of tract of land in proceeding did not impliedly authorize application of code of civil procedure. State Highway Commission v. Bullard, 208 K. 558, 560, 493 P.2d 196.
3. Allowance of attorney's fee requires clear statutory authority. Schwartz v. Western Power & Gas Co., Inc., 208 K. 844, 849, 850, 494 P.2d 1113.
4. Date fixed by judge for filing appraiser's report is date from which appeal time computed, regardless of when report is delivered. Urban Renewal Agency v. Reed, 211 K. 705, 706, 708, 508 P.2d 1227.
5. Act applied; injunction proceeding against electric utility; no abuse of discretion; trial court's findings reviewed and affirmed. Concerned Citizens, United, Inc. v. Kansas Power and Light Co., 215 K. 218, 226, 523 P.2d 755.
6. Court had no power to correct, modify or amend award following appeal or time for appeal. Unified School District v. Turk, 219 K. 655, 657, 658, 549 P.2d 882.
7. Determination that taking of land is necessary to lawful corporate purposes made by district court from allegations of petition. Steele v. Missouri Pacific R.R. Co., 232 K. 855, 857, 858, 863, 659 P.2d 217 (1983).
8. Condemner's rights acquired and compensation to landowner considered. Barcus v. City of Kansas City, 8 K.A.2d 506, 507, 661 P.2d 806 (1983).
9. Cited in holding 60-2102 does not provide for appeals in original eminent domain proceedings. *In re* Condemnation of Land for State Highway Purposes, 235 K. 676, 682, 683 P.2d 247 (1984).
10. Appeal of eminent domain proceedings under 60-2102(b); original proceeding in eminent domain not truly classed as litigation. Razook v. Kemp, 236 K. 156, 159, 690 P.2d 376 (1984).
11. Where appraisers' report filed after date fixed by court, parties have 30 days thereafter to appeal. City of Shawnee v. Webb, 236 K. 504, 505, 507, 694 P.2d 896 (1985).

26-505. Same; appraisers' oath, instructions, reports and notification to condemner; notice to interested persons by condemner; fees and expenses. After the appraisers are appointed they shall take an oath to faithfully discharge their duties as appraisers. The judge shall instruct them to the effect that they are officers of the court and not representatives of the plaintiff or any other party, that they are to receive their instructions only from the judge, and he shall instruct them as to the nature of their duties and authority, and as to the basis, manner and measure of ascertaining the value of the land taken and damages result-

ing therefrom. The instructions shall be in writing. Upon the completion of their work the appraisers shall file their report in the office of the clerk of the district court and the appraisers shall thereupon notify the condemner of such filing. The condemner shall, within three (3) days after receiving such notice, mail a written notice of the filing of such report to every person who owns any interest in any of the property being taken, if the address of such person is known, and shall file in the office of the clerk of the district court an affidavit showing proof of the mailing of such notice. The fees and expenses of the appraisers shall be determined and allowed by the court.

History: L. 1963, ch. 234, § 5; L. 1968, ch. 138, § 1; July 1.

Research and Practice Aids:

Eminent Domain 229, 233, 234(5).
C.J.S. Eminent Domain §§ 277, 295, 303.

CASE ANNOTATIONS

1. Applied; dismissal of tract of land in proceeding did not impliedly authorize application of code of civil procedure. State Highway Commission v. Bullard, 208 K. 558, 560, 493 P.2d 196.

2. Allowance of attorney's fee requires clear statutory authority. Schwartz v. Western Power & Gas Co., Inc., 208 K. 844, 850, 494 P.2d 1113.

3. Date fixed by judge for filing appraiser's report is date from which appeal time computed, regardless of when report is delivered. Urban Renewal Agency v. Reed, 211 K. 705, 708, 709, 508 P.2d 1227.

4. Constructive notice provisions complied with; effect of actual notice. Unified School District v. Turk, 219 K. 655, 659, 549 P.2d 882.

26-506. Same; view of lands by appraisers. (a) *Notice, time, place and manner of hearing.* The appraisers shall, after they have been sworn, and instructed by the judge, make their appraisal and assessment of damages, by actual view of the lands to be taken and of the tracts of which they are a part, and by hearing of oral or written testimony from the plaintiff and each interested party as named in section K.S.A. 26-502. Such testimony shall be given at a public hearing held in the county where the action is pending at a time and place fixed by the appraisers. Notice of the hearing shall be mailed at least ten (10) days in advance thereof to the plaintiff and to each party named in the petition if their address is known or can with reasonable diligence be ascertained, and by one publication in a newspaper of general circulation in each county where the lands are situated at least ten (10) days in advance of the hearing. In case of failure to meet on the day designated in the notice, the appraisers may meet on the following day without further notice; but in case of failure to meet on either of said days, a new notice shall be required. A hearing begun pursuant to proper notice may be continued or adjourned from day to day and from place to place until the hearing with respect to all properties involved in the action has been concluded.

(b) *Form of notice.* The notice of hearing shall be in substantially the following form:

IN THE DISTRICT COURT OF _____ COUNTY, KANSAS.
_____ Plaintiff, vs. _____ Defendant,

Notice is hereby given that the undersigned appraisers appointed by the court, will, in accordance with the provisions of this act, hold a public hearing on all matters pertaining to their appraisal of compensation and the assessment of damages for the taking of the lands or interests therein sought to be taken by the plaintiff in the above entitled matter covering the following described lands (description of lands). Such hearing will commence at _____ o'clock ____M. on the _____ day of _____, 19____ at _____, or on the following day without further notice, and may be continued thereafter from day to day or place to place until the same is concluded with respect to all properties involved in the action. Any party may present either oral or written testimony at such hearing.

You are further notified that the court has set the _____ day of _____, 19____, for the filing of the awards of these appraisers with the clerk of the court, and any party dissatisfied with the award may appeal therefrom as by law permitted within thirty days from the day of filing.

_____ _____ _____ Appraisers.

History: L. 1963, ch. 234, § 6; Jan. 1, 1964.

Research and Practice Aids:

Eminent Domain 231, 232.
C.J.S. Eminent Domain §§ 279, 296, 298.

CASE ANNOTATIONS

1. Duty of condemner to ascertain parties. Dotson v. State Highway Commission, 198 K. 671, 674, 426 P.2d 138.

2. Date fixed by judge for filing appraiser's report is date from which appeal time computed, regardless of when report is delivered. Urban Renewal Agency v. Reed, 211 K. 705, 706, 708, 508 P.2d 1227.

3. Constructive notice provisions complied with; effect of actual notice. Unified School District v. Turk, 219 K. 655, 659, 549 P.2d 882.

26-507. Same; payment of award and vesting of rights; abandonment. (a) *Payment of award; vesting of rights.* If the plaintiff desires to continue with the proceeding as to particular tracts it shall, within thirty (30) days from the time the appraisers' report is

filed pay to the clerk of the district court the amount of the appraisers' award as to those particular tracts and court costs accrued to date, including appraisers' fees. Such payment shall be without prejudice to plaintiff's right to appeal from the appraisers' award. Upon such payment being made the title, easement or interest appropriated in the land condemned shall thereupon immediately vest in the plaintiff, and it shall be entitled to the immediate possession of the land to the extent necessary for the purpose for which taken and consistent with the title, easement or interest condemned. The plaintiff shall be entitled to all the remedies provided by law for the securing of such possession.

(b) *Abandonment.* If the plaintiff does not make the payment prescribed in subsection (a) hereof for any of the tracts described in the petition, within thirty (30) days, from the time the appraisers' report is filed, the condemnation is abandoned as to those tracts, and judgment for costs, including the appraisers' fees together with judgment in favor of the defendant for his reasonable expenses incurred in defense of the action, shall be entered against the plaintiff. After such payment is made by the plaintiff to the clerk of the court, as provided in subsection (a) hereof, the proceedings as to those tracts for which payment has been made can only be abandoned by the mutual consent of the plaintiff and the parties interested in the award.

History: L. 1963, ch. 234, § 7; Jan. 1, 1964.

Research and Practice Aids:

Eminent Domain⇨74, 76, 246(3).
C.J.S. Eminent Domain §§ 186 et seq., 336.

Law Review and Bar Journal References:

Survey of the law of damages, David Prager, 12 K.L.R. 204 (1963).

CASE ANNOTATIONS

1. Exercise of motion to dismiss; does not impliedly inject code of civil procedure into condemnation proceedings. State Highway Commission v. Bullard, 208 K. 558, 560, 561, 493 P.2d 196.

2. Referred to; court had no authority to modify or amend award after appeal or time for appeal. Unified School District v. Turk, 219 K. 655, 658, 549 P.2d 882.

3. Writ of assistance applied for hereunder by condemnor; condemnation proceeding not forum for litigation over right of exercise of eminent domain or extent thereof. Kansas Gas & Electric Co. v. Winn, 227 K. 101, 102, 107, 605 P.2d 125.

4. Dismissal of condemnation action by city after purchase of property by agreement with owner does not constitute abandonment permitting defendant lessee to recover reasonable expenses in defense of action. City of Westwood v. M & M Oil Co., 6 K.A.2d 48, 49, 626 P.2d 817.

5. If proceeding is dismissed by condemning authority prior to filing of appraiser's report, landowner not entitled to attorney fees and costs. *In re* Condemnation of Land by the City of Mission v. Bennett, 7 K.A.2d 621, 622, 624, 649 P.2d 406 (1982).

26-508. Appeal from award; notice to parties affected. If the plaintiff, or any defendant, is dissatisfied with the award of the appraisers, he may, within thirty (30) days after the filing of the appraisers' report, appeal from the award by filing a written notice of appeal with the clerk of the district court. In the event any parties shall perfect an appeal, copies of such notice of appeal shall be mailed to all parties affected by such appeal, within three (3) days after the date of the perfection thereof. An appeal by the plaintiff or any defendant shall bring the issue of damages to all interest [interests] in the tract before the court for trial *de novo*. The appeal shall be docketed as a civil action and tried as any other civil action: *Provided, however,* The only issue to be determined therein shall be that of just compensation to be paid for the land or right therein taken at the time of the taking and for any other damages allowable by law.

History: L. 1963, ch. 234, § 8; L. 1968, ch. 138, § 2; July 1.

Research and Practice Aids:

Eminent Domain⇨238(1).
C.J.S. Eminent Domain §§ 343, 346.

Law Review and Bar Journal References:

Survey of Kansas law on real and personal property (1965-1969), 18 K.L.R. 427, 436 (1970).

"Administrative Law: The Kansas Commission on Civil Rights—True De Novo Review Arrives," Samuel D. Ogelby, 16 W.L.J. 161, 163 (1976).

"Judicial Review of Administrative Action—Kansas Perspectives," David L. Ryan, 19 W.L.J. 423, 433 (1980).

CASE ANNOTATIONS

1. Considered in appeal from award. Diefenbach v. State Highway Commission, 195 K. 445, 450, 407 P.2d 228.

2. Appeal from award by one party raises issue of damages to all interests. Dotson v. State Highway Commission, 198 K. 671, 675, 426 P.2d 138.

3. The phrase "tried as any other civil action" applies to presentation of facts on appeal, not to formation of pleadings; eminent domain statute forms the issue and takes the place of pleadings. City of Wellington v. Miller, 200 K. 651, 652, 438 P.2d 53.

4. No dismissal without prejudice of appeal in condemnation proceeding; when one party appeals, other parties are in position of cross-appellants and appeal

cannot be discussed over objection of any person having interest in the land. City of Wellington v. Miller, 200 K. 651, 652, 653, 438 P.2d 53.

5. Docketing of an appeal as a civil action not changed by amendment. State Highway Commission v. Lee, 207 K. 284, 290, 485 P.2d 310.

6. Limitation on appeal from award does not apply to determination of disputes as to distribution between co-owners. Urban Renewal Agency v. Naegele Outdoor Advertising Co., 208 K. 210, 212, 214, 215, 216, 491 P.2d 886.

7. Motion to dismiss as to certain tract of land; procedural; motion to intervene by leaseholder not allowed. State Highway Commission v. Bullard, 208 K. 558, 560, 493 P.2d 196.

8. Date fixed by judge for filing appraiser's report is date from which appeal time computed, regardless of when report is delivered. Urban Renewal Agency v. Reed, 211 K. 705, 706, 508 P.2d 1227.

9. Appeal hereunder; 26-509 construed; attorney fees allowed where action commenced on date section became effective. Fellers v. State Highway Commission, 214 K. 630, 631, 522 P.2d 341.

10. Court had no power to correct, modify or amend award following appeal or time for appeal. Unified School District v. Turk, 219 K. 655, 657, 549 P.2d 882.

11. Compensable damages for taking access to motel; parol evidence upheld. Kohn Enterprises, Inc. v. City of Overland Park, 221 K. 230, 233, 559 P.2d 771.

12. Method of establishing value of property upheld; no abuse of discretion in admission of testimony or evidence. Ellis v. City of Kansas City, 225 K. 168, 175, 589 P.2d 552.

13. Trial court did not abuse discretion in excluding evidence of specific value of leasehold interest but allowing evidence thereof as factor in arriving at value. City of Manhattan v. Kent, 228 K. 513, 516, 517, 519, 520, 618 P.2d 1180.

14. District court without jurisdiction to enlarge appeal period of this section. City of Kansas City v. Crestmoore Downs, Inc., 7 K.A.2d 515, 516, 517, 518, 644 P.2d 494 (1982).

15. Evidence of biological hazard of high-voltage utility line did not relate to determination of compensation. Meinhardt v. Kansas Power & Light Co., 8 K.A.2d 471, 472, 661 P.2d 820 (1983).

16. Proposed expert testimony concerning harmful biological effects of electricity from overhead power lines excluded. Meinhardt v. Kansas Power & Light Co., 8 K.A.2d 471, 472, 661 P.2d 820 (1983).

17. Court rulings prior to appeal providing trial de novo not res judicata to reconsideration of issues at de novo trial. U.S.D. No. 464 v. Porter, 234 K. 690, 692, 693, 676 P.2d 84 (1984).

18. Where appraisers' report filed after date fixed by court, parties have 30 days thereafter to appeal. City of Shawnee v. Webb, 236 K. 504, 505, 507, 694 P.2d 896 (1985).

26-509. Same; assignment for trial on appeal; attorney fees, when. In an action on appeal the court shall assign the case for trial to a jury, or to a master in accordance with K.S.A. 60-253, or acts amendatory thereof or supplemental thereto. Whenever the plaintiff condemner shall appeal the award of court appointed appraisers, and the jury renders a verdict for the landowners in an amount greater than said appraisers' award, the court may allow as court costs an amount to be paid to the landowner's attorney as attorney fees.

History: L. 1963, ch. 234, § 9; L. 1969, ch. 196, § 1; L. 1972, ch. 148, § 1; July 1.

Revisor's Note:

Consideration of contingent fee contract in awarding attorney fees, see *Kansas Benchbook*, Kansas Judicial Council, p. 130.

Research and Practice Aids:

Eminent Domain 238(6), 239.

C.J.S. Eminent Domain §§ 281, 360 et seq., 372.

Law Review and Bar Journal References:

"Recovery of Attorney Fees in Kansas," Mark A. Furney, 18 W.L.J. 535, 549, 558 (1979).

CASE ANNOTATIONS

1. Right to court costs did not accrue until jury rendered verdict; provisions remedial; factors considered. City of Wichita v. Chapman, 214 K. 575, 576, 579, 583, 585, 587, 588, 521 P.2d 589.

2. Provisions of section providing for attorney fees remedial; application to actions pending when section became effective. Fellers v. State Highway Commission, 214 K. 630, 631, 632, 522 P.2d 341.

3. Mentioned; trial court erred in awarding attorney fees to landowners who were appealing parties. *In re* Central Kansas Electric Coop., Inc., 224 K. 308, 319, 582 P.2d 228.

4. Statute applicable only to condemnation appeals from appraisers' awards under 26-501 et seq.; legislature has not provided for attorney fees in inverse condemnation cases. Herman v. City of Wichita, 228 K. 63, 71, 72, 612 P.2d 588.

26-510. Same; withdrawal of payment. The defendants may by order of the judge and without prejudice to their right of appeal withdraw the amount paid to the clerk of the court as their interests are determined by the appraisers' report.

History: L. 1963, ch. 234, § 10; Jan. 1, 1964.

Research and Practice Aids:

Eminent Domain 238(7).

C.J.S. Eminent Domain § 366 et seq.

26-511. Interest on final judgment. (a) If the compensation finally awarded on appeal exceeds the amount of money paid to the clerk of the court pursuant to K.S.A. 26-507, the judge shall enter judgment against the plaintiff for the amount of the deficiency, with interest. If the compensation finally awarded on appeal is less than the amount paid to the clerk of the court pursuant to K.S.A. 26-507, the judge shall enter judgment in favor of the plaintiff for the return of the difference, with interest.

(b) If the money paid to the clerk of the court under K.S.A. 26-507 is paid before July 1, 1982, the judgment shall bear interest as follows:

(1) On and after the date of the payment to the clerk and before July 1, 1982, at the rate of 6% per annum; and

(2) on and after July 1, 1982, and until the date the judgment is paid, at the rate provided by K.S.A. 16-204 and amendments thereto.

(c) If the money paid to the clerk of the court under K.S.A. 26-507 is paid on or after July 1, 1982, the judgment shall bear interest, on and after the date of the payment to the clerk and until the date the judgment is paid, at the rate provided by K.S.A. 16-204 and amendments thereto.

History: L. 1963, ch. 234, § 11; L. 1982, ch. 88, § 2; July 1.

Research and Practice Aids:
Eminent Domain⇐238(7).
C.J.S. Eminent Domain § 366 et seq.

CASE ANNOTATIONS

1. Specific reference to interest on eminent domain judgments controls over general provision. Schwartz v. Western Power & Gas Co., Inc., 208 K. 844, 851, 494 P.2d 1113.

2. Special statute applicable only to condemnation appeals taken under eminent domain procedure act, 26-501 et seq. Herman v. City of Wichita, 228 K. 63, 68, 69, 612 P.2d 588.

3. Determination of rate of post-judgment interest. Meinhardt v. Kansas Power & Light Co., 8 K.A.2d 471, 473, 661 P.2d 820 (1983).

26-512. Same; making surveys and location. The prospective condemner or its agents may enter upon the land and make examinations, surveys and maps thereof, and such entry shall constitute no cause of action in favor of the owners of the land, except for actual damages thereto.

History: L. 1963, ch. 234, § 12; Jan. 1, 1964.

Research and Practice Aids:
Eminent Domain⇐77.
C.J.S. Eminent Domain § 192.

26-513. Same; compensation. (a) *Necessity.* Private property shall not be taken or damaged for public use without just compensation.

(b) *Taking entire tract.* If the entire tract of land or interest therein is taken, the measure of compensation is the value of the property or interest at the time of the taking.

(c) *Partial taking.* If only a part of a tract of land or interest is taken, the compensation and measure of damages are the difference between the value of the entire property or interest immediately before the taking, and the value of that portion of the tract or interest remaining immediately after the taking.

(d) *Factors to be considered.* In ascertaining the amount of compensation and damages as above defined, the following factors, without restriction because of enumeration, shall be given consideration if shown to exist but they are not to be considered as separate items of damages, but are to be considered only as they affect the total compensation and damage under the provisions of subsections (b) and (c) of this section:

1. The most advantageous use to which the property is reasonably adaptable.
2. Access to the property remaining.
3. Appearance of the property remaining, if appearance is an element of value in connection with any use for which the property is reasonably adaptable.
4. Productivity, convenience, use to be made of the property taken, or use of the property remaining.
5. View, ventilation and light, to the extent that they are beneficial attributes to the use of which the remaining property is devoted or to which it is reasonably adaptable.
6. Severance or division of a tract, whether the severance is initial or is in aggravation of a previous severance; changes of grade and loss or impairment of access by means of underpass or overpass incidental to changing the character or design of an existing improvement being considered as in aggravation of a previous severance, if in connection with the taking of additional land and needed to make the change in the improvement.
7. Loss of trees and shrubbery to the extent that they affect the value of the land taken, and to the extent that their loss impairs the value of the land remaining.
8. Cost of new fences or loss of fences and the cost of replacing them with fences of like quality, to the extent that such loss affects the value of the property remaining.
9. Destruction of a legal nonconforming use.
10. Damage to property abutting on a right-of-way due to change of grade where accompanied by a taking of land.
11. Proximity of new improvement to

improvements remaining on condemnee's land.

12. Loss of or damage to growing crops.

13. That the property could be or had been adapted to a use which was profitably carried on.

14. Cost of new drains or loss of drains and the cost of replacing them with drains of like quality, to the extent that such loss affects the value of the property remaining.

15. Cost of new private roads or passageways or loss of private roads or passageways and the cost of replacing them with private roads or passageways of like quality, to the extent that such loss affects the value of the property remaining.

History: L. 1963, ch. 234, § 13; L. 1969, ch. 196, § 2; July 1.

Research and Practice Aids:

Eminent Domain—69, 126(1).

C.J.S. Eminent Domain §§ 96, 136 et seq.

Law Review and Bar Journal References:

"The Eminent Domain Procedure Act," Marion Beatty, 32 J.B.A.K. 130 (1964).

"1969 Kansas Legislature—A Review of Enactment," Robert F. Bennett, 38 J.B.A.K. 89, 127 (1969).

Survey of Kansas law on real and personal property (1965-1969), 18 K.L.R. 427, 436 (1970).

Elimination of nonconforming uses; mobile homes in Kansas, Gerald E. Hertach, 20 K.L.R. 87, 107 (1971).

"Lateral Support—An Inversely Condemnable Property Right," George A. Gaitas, 13 W.L.J. 248, 249, 251 (1974).

CASE ANNOTATIONS

1. Doctrine of burden of proof not applicable to condemnation proceedings. City of Wichita v. Jennings, 199 K. 621, 626, 433 P.2d 351.

2. Subsection (c) considered; verdict of jury was "within the range" of the evidence. Kansas State Highway Commission v. Roepke, 200 K. 660, 663, 665, 666, 438 P.2d 122.

3. Compensation is necessary replacement in taking of property of one governmental agency by another. City of Wichita v. Unified School District No. 259, 201 K. 110, 439 P.2d 162.

4. Evidence establishing value of entire property before taking was properly taken. Humphries v. State Highway Commission, 201 K. 544, 546, 549, 442 P.2d 475.

5. No error in permitting landowner's witnesses to testify as to separate items of damage resulting from partial taking. Dibble v. State Highway Commission, 204 K. 111, 112, 460 P.2d 584.

6. Cost of removal by lessee of personalty from leased premises for reasonable distance is not compensable element of damage. City of Manhattan v. Eriksen, 204 K. 150, 153, 154, 155, 460 P.2d 522.

7. Applied; 68-413 does not provide procedure for exercising right of eminent domain, but merely designates interests which highway commission may acquire through such procedure. State Highway Commission v. Moore, 204 K. 502, 504, 464 P.2d 188.

8. Cost of removal by lessee of his personalty not an element of damage for which compensation is allowed. Phillips Petroleum Co. v. Bradley, 205 K. 242, 248, 468 P.2d 95.

9. Subsection (c) mentioned in determining rights of condemner in eminent domain proceeding (dissenting opinion). City of Bonner Springs v. Coleman, 206 K. 689, 700, 481 P.2d 950.

10. Legislature intent relating to just compensation and market value (dissenting opinion). State Highway Commission v. Lee, 207 K. 284, 313, 485 P.2d 310.

11. Where plaintiff establishes no "before" and "after" value, verdict not within range established by defendant cannot stand. City of Wichita v. May's Company, Inc., 212 K. 153, 155, 156, 510 P.2d 184.

12. Mentioned; no misconduct in awarding damages where jury added experts' estimated values and divided total obtained by number of experts. Hogue v. Kansas Power & Light Co., 212 K. 339, 345, 347, 510 P.2d 1308.

13. Mentioned; purchase of corporate utility on expiration of franchise is statutory contract right and value not determined under law of eminent domain. City of Kiowa v. Central Telephone & Utilities Corporation, 213 K. 169, 172, 515 P.2d 795.

14. Applied; unit rule method of valuation stated and applied; partial taking; award not based on improper evidence. Rostine v. City of Hutchinson, 219 K. 320, 323, 548 P.2d 756.

15. Compensable damages for taking access to motel; parol evidence upheld. Kohn Enterprises, Inc. v. City of Overland Park, 221 K. 230, 233, 559 P.2d 771.

16. Contention property damaged by factor specified in section; changing street to controlled access facility constituted taking private property for public use. Teachers Insurance & Annuity Ass'n of America v. City of Wichita, 221 K. 325, 329, 559 P.2d 347.

17. Subsection (c) applied; swine producing property did not qualify for "special use" determination of value. *In re* Central Kansas Electric Coop., Inc., 224 K. 308, 316, 317, 582 P.2d 228.

18. Method of establishing value of property upheld; no abuse of discretion in admission of testimony or evidence. Ellis v. City of Kansas City, 225 K. 168, 170, 171, 589 P.2d 552.

19. Subsections (a) and (b) mentioned; error to use the substitute facilities method of determining compensation in eminent domain proceedings against a church's property. Urban Renewal Agency of Wichita v. Gospel Mission Church, 4 K.A.2d 101, 103, 105, 603 P.2d 209.

20. On issue of value jury is not bound by expert opinion evidence; all evidence may be considered. Kansas Power & Light Co. v. Floersch, 4 K.A.2d 440, 608 P.2d 1023.

21. Condemnation proceeding not improper; comparable market values should be used where available. Consultation, Inc. v. City of Lawrence, 5 K.A.2d 486, 487, 619 P.2d 150.

22. Trial court did not abuse discretion in excluding evidence of specific value of leasehold interest but allowing evidence thereof as factor in arriving at value. City of Manhattan v. Kent, 228 K. 513, 517, 618 P.2d 1180.

23. Public fear of power lines held proper consideration in determination of market value. Willsey v. Kansas City Power and Light Co., 6 K.A.2d 599, 615, 631 P.2d 268 (1981).

24. Rights actually acquired by condemner is proper measure of compensation. Barcus v. City of Kansas City, 8 K.A.2d 506, 507, 661 P.2d 806 (1983).

25. Cited; mere plotting and planning in anticipation of a public improvement does not constitute a taking or damaging property. Lone Star Industries, Inc. v. Secretary, Dept. of Transp., 234 K. 121, 123, 671 P.2d 511 (1983).

26. Evidence of comparable sales and various factors herein not authorization to find "before" and "after" values outside range of opinion evidence. Mettee v. Kemp, 236 K. 781, 789, 696 P.2d 947 (1985).

26-514. Fixing of benefit districts and levying of special tax assessments no part of eminent domain procedure. In all cases where costs of the improvement are to be paid for, in whole or in part, by fixing benefit districts or by means of apportionment of benefits on all property benefited, the assessments shall be levied and collected as the statutes now authorize, or may hereafter authorize the assessment, levy and collection of the expense of public improvements, but such special assessments shall not be any part of the condemnation proceedings.

History: L. 1963, ch. 234, § 14; Jan. 1, 1964.

Research and Practice Aids:
Eminent Domain⇨166.
C.J.S. Eminent Domain § 209.

26-515. Same; proceedings pending prior to effective date of this act; invalidity of part. All proceedings or actions under any power of eminent domain pending at the time of the effective date of this act shall be completed in conformity with the laws in effect prior to such date.

If any part or parts of this act shall be held unconstitutional, such unconstitutionality shall not affect the validity of the remaining parts of this act. The legislature hereby declares that it would have passed the remaining parts of this act if it had known that such part or parts thereof would be declared unconstitutional.

History: L. 1963, ch. 234, § 15; Jan. 1, 1964.

Research and Practice Aids:
Eminent Domain⇨167(1).
C.J.S. Eminent Domain § 210 et seq.

26-516. Same; citation of act. This act may be cited as the "eminent domain procedure act."

History: L. 1963, ch. 234, § 16; Jan. 1, 1964.

26-517. Dispute among parties as to division of award or amount of judgment; determination by court. In any action involving the condemnation of real property in which there is a dispute among the parties in interest as to the division of the amount of the appraisers' award or the amount of the final judgment, the district court shall, upon motion by any such party in interest, determine the final distribution of the amount of the appraisers' award or the amount of the final judgment.

History: L. 1969, ch. 196, § 3; July 1.

CASE ANNOTATIONS

1. Final distribution of appraiser's award where dispute arises among inerested parties is judicial matter and appeal will lie. Urban Renewal Agency v. Naegele Outdoor Advertising Co., 208 K. 210, 212, 213, 214, 215, 216, 491 P.2d 886.

2. Trial court did not abuse discretion in excluding evidence of specific value of leasehold interest but allowing evidence thereof as factor in arriving at value. City of Manhattan v. Kent, 228 K. 513, 514, 517, 519, 618 P.2d 1180.

3. Cited in holding 60-2102 does not provide for appeals in original eminent domain proceedings. *In re* Condemnation of Land for State Highway Purposes, 235 K. 676, 682, 683 P.2d 247 (1984).

of fact and conclusions of law held adequate. Duffin v. Patrick, 212 K. 772, 773, 512 P.2d 442.

2. No issue obligating court to make findings of fact; default judgment not void on grounds alleged. Automatic Feeder Co. v. Tobey, 221 K. 17, 22, 558 P.2d 101.

60-252b. Rules of supreme court. The supreme court is hereby authorized and directed to adopt such rules as are necessary, and to require such reports from the district courts or clerks thereof, to insure compliance by such courts with the provisions of K.S.A. 60-252a.

History: L. 1971, ch. 198, § 2; July 1.

CASE ANNOTATIONS

1. Mentioned in breach of contract action; findings of fact and conclusions of law held adequate. Duffin v. Patrick, 212 K. 772, 773, 512 P.2d 442.

60-253. Trial by masters. (a) *Appointment and compensation.* As used in this chapter the word "master" includes a referee, an auditor, a commissioner and an examiner. The compensation to be allowed to a master shall be fixed by the court, and shall be charged upon such of the parties or paid out of any fund or subject matter of the action, which is in the custody and control of the court as the court may direct. The master shall not retain his or her report as security for his or her compensation; but when the party ordered to pay the compensation allowed by the court does not pay it after notice and within the time prescribed by the court, the master is entitled to a writ of execution against the delinquent party. The master must be sworn or affirmed well and faithfully to hear and examine the cause, and to make a just and true report therein, according to the best of the master's understanding. The oath may be administered by any person authorized to take depositions.

(b) *Reference.* With the consent of the parties, all or any issues of fact or law or both may be referred to a master. Otherwise, the judge may order a reference only on a finding that the ends of justice will be measurably advanced thereby, and, in a case triable to a jury, only on such issues as involve an examination of complex or voluminous accounts.

(c) *Powers.* The order of reference to the master may specify or limit the master's powers and may direct him or her to report only upon particular issues or to do or perform particular acts or to receive and report evidence only and may fix the time and place for beginning and closing the hearings and for the filing of the master's report. Subject to the specifications and limitations stated in the order, the master has and shall exercise the power to regulate all proceedings in every hearing before him or her and to do all acts and take all measures necessary or proper for the efficient performance of his or her duties under the order. The master may require the production before him or her of evidence upon all matters embraced in the reference, including the production of all books, papers, vouchers, documents, and writings applicable thereto. The master may rule upon the admissibility of evidence unless otherwise directed by the order of reference and has the authority to put witnesses on oath and may examine them and may call the parties to the action and examine them upon oath. When a party so requests, the master shall make a record of the evidence offered and excluded in the same manner and subject to the same limitations as provided in K.S.A. 60-243 (c) for a court sitting without a jury.

(d) *Proceedings.* (1) *Meetings.* When a reference is made, the clerk shall forthwith furnish the master with a copy of the order of reference. Upon receipt thereof unless the order of reference otherwise provides, the master shall forthwith set a time and place for the first meeting of the parties or their attorneys to be held within twenty (20) days after the date of the order of reference and shall notify the parties or their attorneys. It is the duty of the master to proceed with all reasonable diligence. Either party, on notice to the parties and master, may apply to the court for an order requiring the master to speed the proceedings and to make his or her report. If a party fails to appear at the time and place appointed, the master may proceed *ex parte* or, in the master's discretion, adjourn the proceedings to a future day, giving notice to the absent party of the adjournment.

(2) *Witnesses.* The parties may procure the attendance of witnesses before the master by the issuance and service of subpoenas as provided in K.S.A. 60-245. If without adequate excuse a witness fails to appear or give evidence, he or she may be punished as for a contempt and be subjected to the consequences, penalties, and remedies provided in K.S.A. 60-237 and 60-245.

(3) *Statement of accounts.* When mat-

ters of accounting are in issue before the master, he or she may prescribe the form in which the accounts shall be submitted and in any proper case may require or receive in evidence a statement by a certified public accountant who is called as a witness. Upon objection of a party to any of the items thus submitted or upon a showing that the form of statement is insufficient, the master may require a different form of statement to be furnished, or the accounts or specific items thereof to be proved by oral examination of the accounting parties or upon written interrogatories or in such other manner as he or she directs.

(e) *Report.* (1) *Contents and filing.* The master shall prepare a report upon the matters submitted to him or her by the order of reference and, if required to make findings of fact and conclusions of law, he or she shall set them forth in the report. The master shall file the report with the clerk of the court and in an action to be tried without a jury, unless otherwise directed by the order of reference, shall file with it a transcript of the proceedings and of the evidence and the original exhibits. The clerk shall forthwith mail to all parties notice of the filing.

(2) *In nonjury actions.* In an action to be tried without a jury the court shall accept the master's findings of fact unless clearly erroneous. Within ten (10) days after being served with notice of the filing of the report any party may serve written objections thereto upon the other parties. Application to the court for action upon the report and upon objections thereto shall be by motion and upon notice as prescribed in K.S.A. 60-206 (d). The court after hearing may adopt the report or may modify it or may reject it in whole or in part or may receive further evidence or may recommit it with instructions.

(3) *In jury actions.* In an action to be tried by a jury the master shall not be directed to report the evidence unless required by the court. If the master is available for cross-examination his or her findings upon the issues submitted to him or her are admissible as evidence of the matters found and may be read to the jury, subject to the ruling of the court upon any objections in point of law which may be made to the report.

(4) *Stipulation as to findings.* The effect of a master's report is the same whether or not the parties have consented to the reference; but, when the parties stipulate that a master's findings of fact shall be final, only questions of law arising upon the report shall thereafter be considered.

(5) *Draft report.* Before filing his or her report a master may submit a draft thereof to counsel for all parties for the purpose of receiving their suggestions.

History: L. 1963, ch. 303, 60-253; Jan. 1, 1964.

Source or prior law:

(*a*). G.S. 1868, ch. 80, §§ 294, 298; L. 1909, ch. 182, §§ 301, 304; R.S. 1923, 60-2925, 60-2928.

(*b*). G.S. 1868, ch. 80, §§ 291, 292; L. 1909, ch. 182, §§ 298, 299; R.S. 1923, 60-2922, 60-2923.

(*c*). G.S. 1868, ch. 80, § 293; L. 1909, ch. 182, § 300; R.S. 1923, 60-2924.

Cross References to Related Sections:

Certain stipulations and admissions ineffective unless reduced to writing and signed by counsel, see supreme court rule No. 163 (60-2702a).

Evidence, see 60-243, 60-401 et seq.

Findings, adoption by court, see 60-252(*a*).

Service and filing of pleadings and other papers, see 60-205.

Jury trials, 60-238, 60-239.

Grand juries, see ch. 22, art. 30.

Trials in criminal proceedings, see ch. 22, art. 34.

Jury service and selection of jurors, see 43-155 et seq.

Trial of civil actions, code of civil procedure for limited actions, see 61-1716.

Right to trial by jury, see Bill of Rights, Kan. Const., §§ 5, 10.

Research and Practice Aids:

Federal Civil Procedure⇨1871 et seq.; Reference⇨1 et seq.

C.J.S. Federal Civil Procedure § 890; References § 1 et seq.

Barron & Holtzoff Fed. P. & P. §§ 571, 1001, 1136, 1161 to 1171.

Gard's Kansas C.C.P. 60-253.

Vernon's Kansas C.C.P.—Fowks, Harvey & Thomas, 60-253.

Vernon's Kansas Forms, C.C.P.—Hatcher §§ 2.216, 2.3531 et seq., 2.3556 et seq., 2.3576 et seq., 2.3586 et seq.

CASE ANNOTATIONS

Prior law cases, see G.S. 1949, 60-2922 to 60-2924, 60-2928 and the 1961 Supp. thereto.

1. Master's findings determined to be "clearly erroneous"; "entire evidence" defined. Campbell v. Campbell, 198 K. 181, 187, 190, 422 P.2d 932.

2. Appraiser appointed under K.S.A. 17-6712(e) receives power and authority conferred upon a master hereunder. Moore v. New Ammest, Inc., 6 K.A.2d 461, 466, 470, 471, 630 P.2d 167 (1981).

60-254. Judgments. (a) *Definition.* A judgment is the final determination of the rights of the parties in an action.

(b) *Judgment upon multiple claims.*

Volume 6

Appendix 12—K.S.A. 17-1350

or loans secured by real estate mortgages, and stocks, preferred or common, which men of prudence, discretion and intelligence acquire or retain for their own account, and within the limitations of the foregoing, the governing board of the cemetery corporation may retain property properly acquired, without limitation as to time and without regard to its suitability for original purchase: *Provided*, That it may be permissible for such governing body of such a cemetery to invest its funds for perpetual care or permanent maintenance in the erection of a mausoleum upon its grounds or for the partial expense for the erection thereof.

History: L. 1951, ch. 215, § 2; June 30.

Cross References to Related Sections:

Prudent-man rule for fiduciaries, see 17-5004.

17-1350. Dissolution of certain cemetery districts; determination of facts. Whenever any public utility, governmental agency of this state, or the United States, having the power of eminent domain, shall have determined it to be necessary to acquire for public use the existing property owned by any cemetery district in this state, the directors of such cemetery district may present a petition to the district court of the county in which such cemetery property is located, verified by such directors, setting forth such facts and praying that an order be made by the court determining whether such facts exist.

History: L. 1953, ch. 137, § 1; March 27.

17-1351. Same; findings; notice to owners of intention to dissolve district. Such petition shall be heard immediately by such district court, and if the district court shall find that the facts specifically set out in K.S.A. 17-1350 exist, the court shall direct that process be issued in said action notifying all persons owning lots or places of burial in such cemetery, as far as can be determined from the records of such cemetery district, of the intention of the cemetery district to request the dissolution of such cemetery district, such process to be issued by personal service or by publication service in accordance with sections 60-2525 to 60-2527, both sections inclusive, of the General Statutes Supplement of 1951.

History: L. 1953, ch. 137, § 2; March 27.

17-1352. Same; hearing; determination; authority to contract, when. After service, as provided in the preceding section, has been made, a hearing shall be had by said district court, to determine whether such cemetery district should be dissolved, and the property rights of persons living or dead either owning cemetery lots in said cemetery, or buried therein, shall be dissolved and set aside, and, whether it would be to the best interests of all parties concerned for said bodies to be disinterred from said cemetery and reburied in another cemetery or cemeteries. If the court shall find in the affirmative, then the directors of such cemetery district shall be authorized to enter into a contract or contracts for the sale of such cemetery property to such governmental agency or public utility, subject to the approval of the court, and also to enter into a contract or contracts for the removal and reburial of all persons buried in said cemetery, subject to the approval of the court.

History: L. 1953, ch. 137, § 3; March 27.

17-1353. Same; acquisition of locations in certain existing cemeteries. The directors of such cemetery district shall then be authorized to acquire by purchase suitable cemetery lots, or burial locations in other existing cemeteries within a radius of fifty (50) miles of such cemetery, for the reburial of all bodies in such cemetery.

History: L. 1953, ch. 137, § 4; March 27.

17-1354. Same; dissolution of district by court, when; deed; report, approval; order; recordation. Upon the removal and reburial of all bodies, together with the relocation of all markers, monuments and other identifying medium, the court shall be advised of such fact by the directors of such cemetery district, and, if the court finds all of the terms of said contract or contracts have been carried out, the court can declare such cemetery district to be dissolved, and authorize the directors of such cemetery district to execute a deed to such cemetery property to the governmental agency involved. The directors of such cemetery district shall report all payments to the court, and, if approved by the court, the court shall order such cemetery district to pay all costs and expenses from the money received for the sale of such property, a copy of which order shall be filed with the county clerk of the county or counties in which such cemetery district is located, and thereupon such cemetery district shall cease to become a taxing unit.

History: L. 1953, ch. 137, § 5; March 27.

Site Proposal for the Superconducting Super Collider

Kansas

Volume 7

Regional Conditions

For more information, contact:

SSC Project Office
Kansas Department of Commerce
400 W. 8th, Suite 500
Topeka, Kansas 66603
(913) 296-5272

Cover art from the original painting "*Explosion of Creation*" by Kansas artist Philomene Bennett

Cover design by Jennifer Sims, Kansas Geological Survey

Contents

7.1 VIBRATIONS 1
7.1.1 Potential Sources of Vibration 2
7.1.2 Proximity of Principal Sources 2
7.2 NOISE 3
7.2.1 Principal Sources and Levels 3
7.3 CLIMATIC CONDITIONS 3
7.3.1 Temperature, Humidity, and Precipitation 3
7.3.2 Degree-days, Frost, and Snowfall 3
7.3.3 Wind 4
7.3.4 Regional Storms 4

Table

7.1—Historical climate data 5

Figures

7.1—Vibration-recording strations 1
7.2—Annual wind rose for Lawrence, Kansas 4

Appendix

1—Vibration Measurements

Volume 7—Regional Conditions

Few, if any, human-caused disturbances will affect the operation of the collider facility at the proposed Kansas site. The setting is essentially rural and the fact that the proposed tunnel and interaction halls will be about 200 feet underground largely mitigates the effects of surface vibrations and noise caused by human activities.

7.1 VIBRATIONS

The Kansas Geological Survey conducted a series of ground-vibration-monitoring observations at seven sites in the vicinity of the proposed collider oval between May 26 and June 16, 1987 (Figure 7.1). A very sensitive portable seismograph was operated at each of the sites for an average period of about 24 hours. The results of these studies are summarized below and described in detail in the volume 7 appendix (including Figures 7.3-7.8 and Tables 7.2-7.9).

Teledyne RV-320 portacorders and Teledyne S-500 seismometers were set up at seven locations to record vibrations. The seismometer was placed at the bottom of a 1-meter (3.3-foot) hole to reduce its exposure. The bandpass recorded was 1 to 5 Hertz (Hz). The stations were sensitive to as little as 0.1 x 10^{-3} mils rms (milliseconds-root mean square) of vibration.

Vibrations measured on the surface or in surficial material are usually much larger than vibrations measured in rock at depth. Assuming the vibrations are Rayleigh-type surface seismic waves, vibration amplitudes can be roughly estimated for the depth of the proposed collider tunnel from the surface measurements.

In general, vibration levels measured were less than 2 x 10^{-3} mils rms and vibration levels greater than that were temporary and sporadic. Typical sources for vibrations greater than 2 x 10^{-3} mils rms are quarry

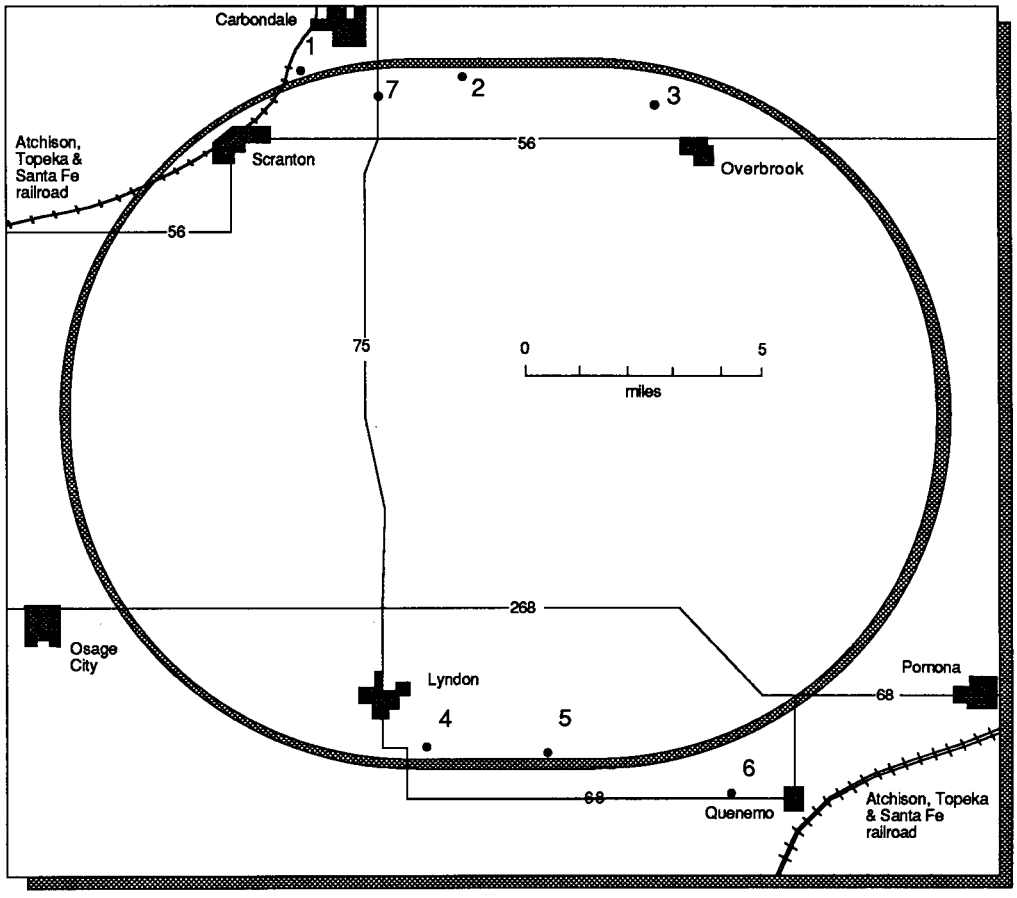


FIGURE 7.1—MAP SHOWING THE SEVEN VIBRATION-RECORDING STATIONS USED TO COLLECT DATA AS WELL AS MAJOR HIGHWAYS AND RAILROADS IN THE AREA.

explosions and wind; these vibrations will be at about 1 Hz. Quarry explosions come from small operations and are erratic and unpredictable. No large, continuously operating quarries are known in the region. Although not human-caused, wind is the greatest potential source for long-term vibration noise greater than 2×10^{-3} mils rms. Wind-noise character is extremely site-dependent. At some sites, wind gusts causing up to 8×10^{-3} mils rms might be expected; however, these would be of short duration.

7.1.1 Potential Sources of Vibration

a. Major highways

Four major highways are in the area. U.S. Highway 75 is the major route south of Topeka; U.S. Highway 56 runs east-west through the northern part of the oval ring; Kansas Highway 268 runs east-west across the southern part from north of Lyndon toward Ottawa; and Kansas Highway 68 runs east from Lyndon (U.S. Highway 75) to Quenemo within 0.5 mile south of the ring and crossing the ring at the southwest edge (south of Lyndon) and at the southeast edge (north of Quenemo).

A station established on the median strip of U.S. Highway 75 recorded maximum rms vibrations of 3.2×10^{-3} mils rms due to trucks and 1×10^{-3} mils rms due to automobiles, all at 5 Hz. When extrapolated to a depth of 200 feet, the vibration is estimated to be 0.1×10^{-3} to 0.2×10^{-3} mils rms at 5 Hz.

b. Railroads

1. A minor line of the Atchison, Topeka & Santa Fe Railroad comes within 0.5 mile of the tunnel at Scranton and passes directly over and through the proposed SSC J3 area, northeast of Scranton. The railroad is on large curve at that location to take advantage of the topography and grade. It can be relocated but construction would involve 1.5 miles of new right-of-way and a maximum depth of cut of 65 feet. It is proposed that J3 be moved along tangent 700 feet to the west to avoid, if possible, the condemnation and relocation of the railroad and property. Because rail traffic is only about one train a day and the vibration levels are below the set limits, it is probable that alternative solutions are feasible. All other interaction areas are well away from possible sources of vibration. The station located 1 mile southeast of Carbondale was about 1,600 feet from the ring. Only three trains were recorded during 26 1/2 hours of operation (over three days). Peak vibration excursions were 3×10^{-3} mils rms at 3 Hz.

2. A very busy line of the Atchison, Topeka & Santa Fe Railroad runs within 1.5 miles of the southeastern edge of the ring at Quenemo. The station 1 mile west of Quenemo was 1.2 miles from the rail line. Peak vibration excursions were 0.8×10^{-3} mils rms at 4 Hz.

Extrapolated to depths of 200 feet, train vibrations are estimated to be generally less than 0.2×10^{-3} mils rms and always less than 2×10^{-3} mils rms.

c. Quarry explosions

Quarry explosions occurred at the rate of one or two per day. Only three were particularly notable and were recorded May 30, May 31, and June 1, 1987. Peak excursions were 3×10^{-3} mils rms at 1.25 Hz, 5×10^{-3} mils rms at 1 Hz, and 5×10^{-3} mils rms at 1.25 Hz, respectively, with durations of 3 to 5 seconds each. Exact locations are unknown. The events of May 31 and June 1 were near Lyndon; the one on May 30 was near Quenemo.

Quarry operations are sporadic in the region; there are no known continuously operating quarries.

d. Wind

Wind gusts caused up to 7×10^{-3} mils rms vibration at 1 Hz with a cumulative duration of about 2 minutes during the course of a day. Wind-gust vibration was more typically 4×10^{-3} to 5×10^{-3} mils rms at about 1 Hz at the two stations that were most sensitive to wind noise. Four out of six stations were not sensitive to wind noise. Maximum wind vibration recorded at one of the four "quiet" stations was 1.5×10^{-3} mils rms at 1 Hz. Note in the detailed discussion included in the appendix that the seismometers that recorded most of the wind vibrations may have characteristics that made them more sensitive to those frequencies.

7.1.2 Proximity of Principal Sources

a. Major highways

U.S. Highway 75 crosses the ring twice. At the northern crossing, it is 2,500 feet from J6. At the southern crossing it is about 3,500 feet from interaction point K6. U.S. Highway 56 crosses the ring twice in the northern part and comes within 7,500 feet of interaction point K2. Kansas Highway 68 touches the ring at two points, one at the intersection with U.S. Highway 75, the other at the intersection of Kansas Highway 268. Otherwise, it is generally 0.5 miles south of the ring. It passes no closer than 650 feet of interaction point K6.

b. Railroads

A minor line of the Atchison, Topeka & Santa Fe Railroad crosses the ring twice near Scranton. In its present location, the railroad crosses J3, although the rail could be moved or the J3 area could be relocated 700 feet to the west, as described in Section 7.1.1. Rail traffic is infrequent (one or two trains per day) and slow moving. The Missouri Pacific Railroad has a line running east-west through the ring just north of Quenemo to Osage City. It is more than 2 miles from an interaction point (K3). A north-south line of the Missouri-Pacific from Overbrook to Quenemo appears to be out of service.

The busiest rail line is the Atchison, Topeka & Santa Fe line southeast of Quenemo. It is 9,000 feet from the ring and 4 miles from interaction point K5.

c. Quarries

No continuously operating quarries are known in the region. Sources of occasional quarry explosions have not been located.

7.2 NOISE

7.2.1 Principal Sources and Levels

The major source of noise in the immediate vicinity of the proposed collider site is associated with farming activities and with traffic-generated noise along major transportation routes through or near the site. Eight rural towns ranging in population from approximately 400 to 2,500 are located within or near the proposed site. The main noise source in these towns is vehicular traffic. Noise levels in Overbrook, Carbondale, and Lyndon were slightly higher because of their locations on U.S. Highways 75 and 56. Except for farms, rural residences, and three rural churches, noise-sensitive receptors are concentrated in the towns. All have churches, schools, and parks. Four towns (Lyndon, Osage City, Burlingame, and Overbrook) have nursing homes. Santa Fe Trail High School, immediately adjacent to the northern cluster of the collider, is located near U.S. 56.

Existing noise levels were measured throughout the project area by the Kansas Department of Transportation using a Metrosonic dB-603 noise-level analyzer operated in the "A" weighted mode. The instrument was calibrated with a General Radio 1567 sound-level calibrator and was set to fast response. The microphone used met the American National Standards Institute S1.4 Type-2 precision criteria.

Noise levels are expressed in decibels (dB), in the "A" weighted mode (dBA), using the equivalent steady-state rating scheme (dBA-Leq). Leq is the equivalent steady-state sound level which, in a stated period of time, contains the same acoustic energy as the time-varying sound level during the same period. The period of time normally used is 1 hour (Leq(h)). The FHWA's noise standards use 67dBA-Leq(h) as a criterion to determine when noise-abatement measures should be considered for human activities. OSHA's regulations stipulate that humans should not be subjected to 90 dB over an eight-hour period of time.

Existing noise levels measured in the rural countryside in the vicinity of the projected SSC site ranged in the upper 40's dBA-Leq(h). Noise levels within 50 feet of major transportation routes and in rural towns during daylight hours ranged in the lower 60's dBA-Leq(h). Sporadic excursions above this level may occur along highways. The noise environment in the rural countryside is more consistent. It is concluded that no existing noise source within the proposed project area will affect operation of the SSC.

7.3 CLIMATIC CONDITIONS

7.3.1 Temperature, Humidity, and Precipitation

Climatological data were obtained from the Topeka office of the National Weather Service located approximately 22 miles due north of the proposed SSC campus area. These data are summarized in Table 7.1. The climate in this region is characterized as continental. Mean temperatures in summer are typically 45° F warmer than in winter. The warmest month is usually July with average high and low temperatures of 89.6 and 67.5° F, respectively. The record high temperature is 110° F. The coldest month is typically January with mean high and low temperatures of 36.2 and 15.7° F, respectively. The record low temperature is -23° F. Average relative humidities range from 65 percent in March to 72 percent in September and December. Relative humidity during the day is typically 24 percentage points lower than during the night in summer; in winter, the diurnal change is about 15 percentage points. Average total precipitation is 33.38 inches, with about 70 percent falling in April through September. Rains during this period are usually of short duration and are almost always associated with thunderstorms. Twenty-four-hour rainfalls of 5 inches or more occur about one in 11 years; 4 inches or more once in three years; and 2 inches or more nine times every four years.

7.3.2 Degree-days, Frost, and Snowfall

Using a base of 65° F, the average yearly total of heating-degree days for Topeka is 5,319. The typical number of cooling-degree days per year is 1,380. Typical frost penetration is 18 inches with a maximum of 30 inches. Snowfall in the region is usually light with an average yearly total of 21.8 inches. Although the record 24-hour snowfall is 15.2 inches, storms of severity sufficient to prevent normal movement of traffic or to interfere with scheduled activities are uncommon.

7.3.3 Wind

The average wind speed in the Topeka region is 10.1 mph. The highest monthly average wind speeds are in March and April (12.3 mph). The calmest month is August (8.6 mph, average). During April through December, winds are predominantly from the south. Northerly winds are most common in January and February. In March, winds are usually from the east. A wind rose for Lawrence, Kansas, 25 miles northeast of the SSC site, is included as Figure 7.2.

7.3.4 Regional Storms

The most frequent type of storm activity in the region is the thunderstorm. The mean number of thunderstorms for Topeka is 56.7 per year. June is the month of most frequent occurrences of thunderstorms with an average of 10.4. Thunderstorms typically occur in the late afternoon and into the early morning particularly when hot and humid conditions exist during summer. These convection-type thunderstorms typically produce brief periods of high winds and heavy rains. Occasionally, these storms can generate damaging hail and rainfall in excess of 0.5 inches. The most powerful thunderstorms can spawn tornadoes. Although tornadoes have been reported from every state in the contiguous United States, they most frequently occur (>7/10,000 sq mi/year) in a region that extends from northern Texas, up through Oklahoma, and into southern Kansas. Tornadoes occur with a relatively lower frequency in the vicinity of the proposed SSC site (about 5/10,000 sq mi/year) than in the area with the highest frequency of tornadoes (>9/10,000 sq mi/year), which is in central Oklahoma (National Severe Storms Forecast Center; Snow, 1984). Since 1951, 16 tornadoes have occurred in Osage County. Three of these tornadoes inflicted damage in excess of $500,000. Of the 17 fatalities caused by these storms, most were the result of one tornado in 1978 that capsized a pleasure-craft boat on Pomona Lake. Based on the size of Osage County (720 square miles) and the frequency of tornadoes (16 in 36 years), we estimate the probability of a tornado occurring in the A, B, E, F, or J areas during the 25-year life span of the SSC to be less than six percent. These areas represent locations of surface buildings and have a combined area of 3.64 square miles.

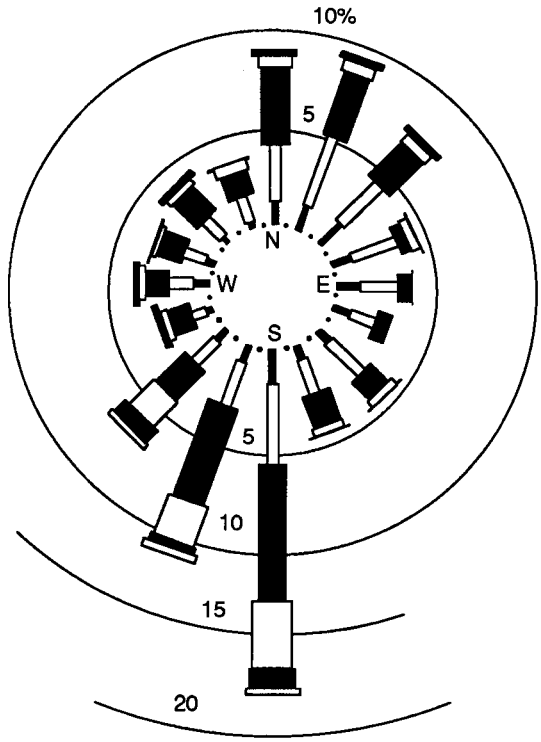


FIGURE 7.2—ANNUAL WIND ROSE FOR LAWRENCE, KANSAS. Length of each bar indicates the percent of occurrence; width of the bar indicates velocity. Velocity ranges, starting with the narrowest bar, are: 0-2, 3-5, 6-10, 11-15, 16-20, and 21-30 mph; from the Atmospheric Science Laboratory, University of Kansas.

Reference

Snow, J. T., 1984, The tornado: Scientific American, v. 250, no. 4, p. 86-96.

TABLE 7.1—HISTORICAL CLIMATE DATA FROM TOPEKA, KANSAS, THROUGH 1985. NORMALS ARE BASED ON THE 1951-1980 RECORD PERIOD.

	Years of Record	J	F	M	A	M	J	J	A	S	O	N	D
Norm. Temp. (°F)													
Average high	30	36.2	43.0	53.2	66.5	76.0	84.6	89.6	88.5	80.7	69.9	53.8	41.8
Average low	30	15.7	21.9	30.4	42.7	53.2	63.1	67.5	65.6	56.2	44.1	31.5	21.8
Relative humidity (%)	21	71	69	65	66	69	71	69	71	72	68	71	72
Normal Precip. (inches)	30	.88	1.05	2.18	3.08	3.99	5.14	4.04	3.69	3.45	2.82	1.75	1.3
Norm. degree days (65° F base)													
Heating	30	1206	910	719	321	117	14	5	0	53	276	69	1029
Cooling	30	0	0	0	0	105	281	427	372	158	28	0	0
Snowfall (inches)	30	6.1	4.8	4.0	0.6	0.0	0.0	0.0	0.0	0.0	T	1.2	5.1
Wind													
Speed (mph)	36	10.1	10.5	12.3	12.3	10.8	10.1	8.7	8.6	8.9	9.3	10.0	10.1
Prevailing direction	36	N	N	E	S	S	S	S	S	S	S	S	S

Volume 7

Appendix--Vibration Measurements

Vibration Measurements

Introduction

Vibration measurements were made at seven sites positioned near the collider ring and interaction points (Figure 7.1) Particular attention was given to measurement of vibrations due to railroad activity at Carbondale and Quenemo and highway traffic on U.S. Highway 75.

Measurements along the northern edge of the ring from Carbondale to Overbrook were made between May 26 and May 29, 1987. This was a stormy week and wetness affected record quality. Station 2 (midway between Carbondale and Overbrook) was disconnected by a farmer after operating more than four hours. It was felt that an adequate record had been obtained and the station was closed and removed.

Measurements along the southern edge of the ring between Lyndon and Quenemo were made from May 30 and June 2, 1987. Weather was blustery--wind typical of Kansas--but not rainy. Wind noise is particularly evident on Station 5 (midway between Lyndon and Quenemo). Train noise is particularly evident at Station 6 (Quenemo) which also recorded a quarry explosion. Station 4 (Lyndon) was mostly quiet with occasional low-level train noise. U.S. Highway 75 was measured on the afternoon of June 16, 1987, with the station in the median strip.

Procedure

A Teledyne S-500 seismometer, sensitive to the velocity of vertical ground motion, was used as a transducer. The S-500 loses sensitivity at frequencies less than 1 Hz, but otherwise has a flat response over the bandwidth of interest (Figure 7.3). Corrections are needed at frequencies less than 2 Hz to compensate for low frequency roll-off. Data were recorded using pen and ink on Teledyne Portacorders, model RV-320. Low-cut filters were set at 0.2 Hz and high-cut filters were set at 5.0 Hz. Typical gain setting was 72 dB, but varied from 60 to 78. Actual response of the Portacorder with 60dB gain was checked using a 4-mV peak-to-peak input signal and was found to be 2mm/mV$\pm$ 20% between 0.5 and 2 Hz rolling off to 1.3 mm/mV$\pm$ 20% at 5 Hz. Figure 7.4 is a plot of the results.

The response of the S-500 seismometer to velocity (G) is 450 V-sec/m $\pm$ 5%. These equations follow:

1. ground velocity $G = \frac{Vo \text{ meters}}{450 \text{ second}}$
2. ground displacement $Ym = \frac{G \text{ meters}}{2\pi f}$

$$Yi = \frac{Ym}{25.4} \times 10^6 \text{ mils}$$

or $$Yi = 13.9 \text{ VoT mils}$$

where T = 1/f is wave period, f is frequency, and Vo is output voltage of the S-500 seismometer. Figure 7.5 is a plot of the overall system output response of the combined S-500 and Portacorder to 10 x 10^{-3} mils of ground displacement.

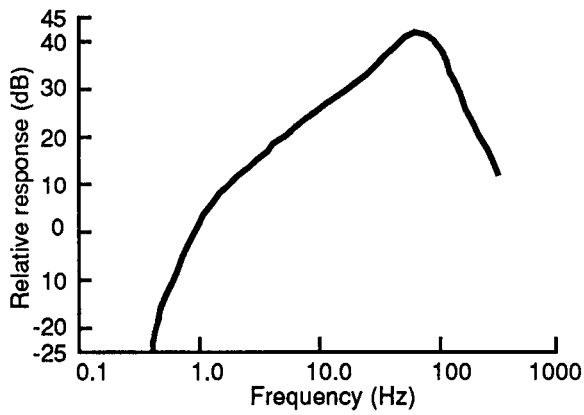


FIGURE 7.3—RESPONSE OF THE TELEDYNE S-500 SEISMOMETER.

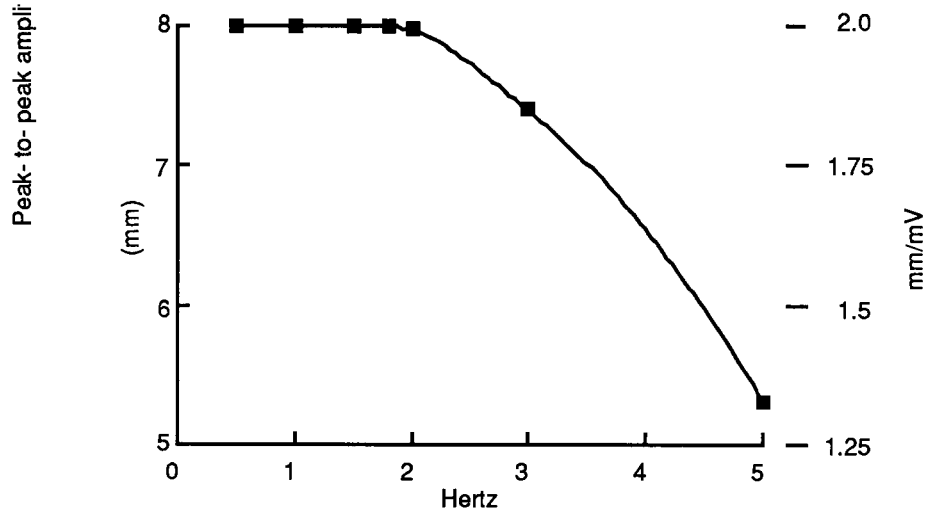


FIGURE 7.4—TELEDYNE PORTACORDER MODEL RV-320 RESPONSE TO 4-MV, PEAK-TO-PEAK INPUT VOLTAGE. Filter passband is 0.2 to 5.0 Hz, and gain is 60dB.

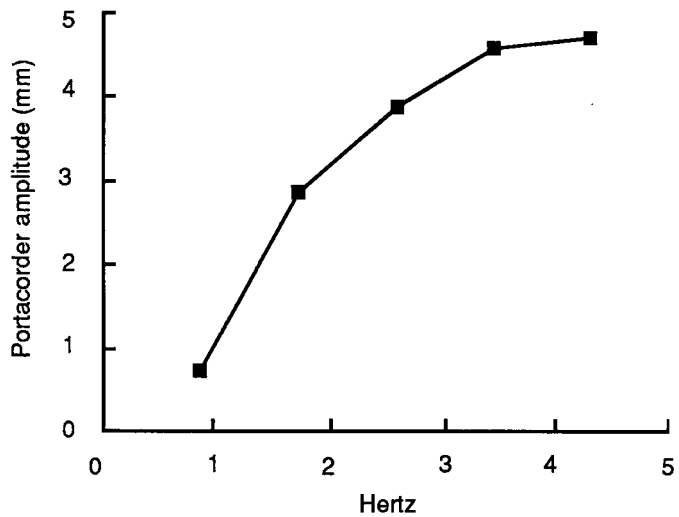


FIGURE 7.5—PREDICTED PORTACORDER AMPLITUDE RESPONSE WITH 60DB GAIN TO 10 X 10^3 MILS GROUND DISPLACEMENT.

Results

Table 7.2 summarizes results from the Carbondale station. Out of 26 1/2 hours of recording, three trains were recorded with a peak excursion of 3 x 10^{-3} mils rms at 3 Hz and a time duration of 1 minute. The typical excursion was 0.7 x 10^{-3} mils at 3 Hz for trains with a time duration of 4 to 8 minutes per train.

Table 7.3 summarizes results from the station midway between Carbondale and Overbrook. Out of 4 hours of record a general wind noise of 1.4 x 10^{-3} mils rms at 2 Hz was recorded. Peak wind gusts of 5 x 10^{-3} mils rms at 1.1 Hz and durations of 2 or 3 seconds were recorded occasionally.

TABLE 7.2—STATION 1, CARBONDALE, WEST EDGE, SEC. 25, T. 14 S., R. 15 E.; 57 M (188 FT) NORTH OF HALF-SECTION LINE, 500 M (1,650 FT) FROM RAILROAD TRACK. Portacorder number: 011041, S-500 #1; App = amplitude peak-to-peak.

A. May 26, record length 10 hours 44 minutes, starting at 1311 CDT, gain = 60dB.

1. Two trains at 3-Hz signal

a. Peak excursion, time duration = 1 minute each at this level
T = 0.3 sec App = 4mm @ 60dB
= 2mV
Yi = .008 mils peak to peak
= .003 mils rms

b. "Typical" excursion, time duration = 4 minutes for one train and 8 minutes for the other train
T = 0.3 sec App = 1 mm @ 60dB
= 0.5 mV
Yi = .002 mils peak-to-peak
= .0007 mils rms

B. May 27, record length 12 hours 35 minutes, starting 1309 CDT, gain = 72dB (note that this day is more sensitive than May 26)

1. One train at 3-Hz signal (0.3 sec)

a. Peak excursion, time duration = 2 minutes
T = 0.35 sec App = 16 mm @ 72dB
= 4 mm @ 60dB
= 2 mV
Yi = .008 mils peak to peak
= .003 mils rms
b. "Typical" excursion, time duration = 20 minutes
T=0.35 sec App = 1 to 4 mm @ 72dB
= .25 to 1 mm @ 60dB
= .125 to 0.5 mV
Yi = .0005 to .002 mils peak to peak
= .0002 to .0007 mils rms

2. General background level (sporadic)

a. Time duration, 1 to 2 sec
T = .375 sec App = 1 mm @ 72dB
= 0.25 mm @ 60dB
= .125 mV
Yi = .0005 mils peak to peak
= .0002 mils rms wind noise)

b. Time duration, 1 to 2 sec

T = 0.6 s ec App = 2.5 mm @ 72dB
= 0.6 mm @ 60dB
= .3 mV

Yi = .002 mils peak to peak
= .0007 mils rms
(wind noise?)

C. May 28, record length 3 hours 20 minutes, starting at ~ 1450 CDT, gain = 72dB, batteries ran down

1. No trains

2. Background sporadic events @ 72dB, time duration about 3 sec

T = .35 sec App = 1 mm @ 72 dB
= .25 mm @ 60dB
= .125 mV

Yi = .0005 mils peak to peak
= .0002 mils rms

TABLE 7.3—STATION 2, MIDWAY BETWEEN CARBONDALE TO OVERBROOK, T. 14 S., R. 16 E., AT 1/2-SECTION LINE BETWEEN SECS. 29 AND 28, ELEVATION MARK 1,128. Portacorder: 040041, S-500 #2.

A. May 26 station disconnected after 4 hours 4 1/2 minutes, gain = 60dB

1. General wind noise (gusty)

a. Time duration 3 seconds

T = .5 s App = 1.2 mm @ 60dB
= 0.6 mV

Yi = .004 mils, peak-to-peak
= .0014 mils, rms

b. Time duration 2 to 3 seconds

T = .9 s App = 2.5 mm @ 60dB
= 1.25 mV

Yi = .015 mils, peak-to-peak
= .005 mils, rms

Table 7.4 summarizes results from the station at Overbrook. The station was very quiet. Wind noise peaked at 1.5 x 10^{-3} mils rms at 0.9 Hz and was sporadic for one day. A train caused up to 1 x 10^{-3} mils rms at 1.6 Hz of vibration. An unknown event caused 2 x 10^{-3} mils rms at 2 Hz of vibration for a duration of 5 seconds. Other events recorded had vibration excursions of less than 1 x 10^{-3} mils rms.

Table 7.5 summarizes results from the station at Lyndon. The station was operated for a total of 42 1/2 hours. Unknown "spikes" of one second duration were prevalent on the record. The "spikes" occurred as frequently as once every 40 to 50 seconds (maximum) and had a maximum excursion of 5 x 10^{-3} mils rms. The "spikes" ebbed and flowed both in terms of amplitude and in terms of periodicity. By the end of the recording period they had disappeared. Two quarry explosions were recorded with vibration excursions of 5 x 10^{-3} mils rms at 1 Hz and 2 x 10^{-3} mils rms at 1.25 Hz. Each event lasted about 5 seconds. All other events recorded at the site, including trains, had vibrations of less than 1 x 10^{-3} mils rms.

Table 7.6 summarizes results from the station midway between Lyndon and Quenemo. The station was operated for 50 1/2 hours. Wind noise was typically recorded with vibrations of 4 x 10^{-3} mils rms at about 1 Hz. Maximum amplitude of gusts was 7 x 10^{-3} mils rms at 1 Hz and represents a cumulative duration of about 2 minutes.

Table 7.7 summarizes the results from the station at Quenemo. The station was operated for about 27 hours. Train vibrations were prevalent with excursions of about

TABLE 7.4—STATION 3, OVERBROOK, WEST EDGE, T. 14 S., R.17 E., SEC. 31, 128 M (422 FT) SOUTH OF NW CORNER. Portacorder 060031, S-500 #3.

A. May 26, record length 2 hours 15 minutes; ink ran dry, gain = 60dB

1. One event (distant train?). Time duration = 25 minutes
   T = 0.6 sec App = 0.8 mm @ 60dB
   = 0.4 mV
   Yi = .003 mils peak-to-peak
   = .001 mils rms

B. May 27, record length, 14 hours 22 minutes, starting at 1519 CDT, gain = 72 dB

1. One event 3-sec time duration, cause unknown
   T = .2 sec App = 2 mm @ 72dB
   = 0.5 mm @ 60dB
   = 0.3 mV
   Yi = .0008 mils peak-to-peak
   = .0003 mils rms

2. About five events (distant trains?). Time duration about 30 sec each
   T = .35 sec App = 1 mm @ 72dB
   = 0.25 mm @ 60dB
   = .125 mV
   Yi = .0005 mils peak-to-peak
   = .0002 mils rms

3. Wind noise, sporadic with 2-3 seconds duration
   T = 1.1 sec App = 1 mm @ 72dB
   = 0.5 mm @ 60dB
   = .25 mV
   Yi = .004 mils peak-to-peak
   = .0015 mils rms

C. May 28, record length 1 hour 30 minutes, batteries dead, gain = 78dB

1. One event time duration = 25 sec, cause unknown

   a. Peak value (time duration 5 sec at this level)
      T = 0.5 sec App = 13 mm, @ 78dB
      = 1.6 mm @ 60dB
      = .8 mV
      Yi = .006 mils peak-to-peak
      = .002 mils rms

   b. "Typical" level, time duration 25 sec
      T = 0.5 sec App = 4 mm @ 78dB
      = 0.5 mm @ 60dB
      = 0.25 mV
      Yi = .0021 mils peak-to-peak
      = .0007 mils rms

2. Wind noise
   T = 1 sec App = 1 mm @ 78dB
   = 0.25 mm @ 60dB
   = 0.125 mV
   Yi = .002 mils peak-to-peak
   = .0007 mils rms

TABLE 7.5—STATION 4, LYNDON, T. 17 S., R. 16 E., SEC. 8, NORTH EDGE, SOUTH SIDE OF ROAD 1/4 MILE EAST OF WEST EDGE. Portacorder 011041; S-500 #1

A. May 30, record length 14 hours 8 minutes, gain = 72dB, start = 1430 CDT

1. Frequent low-amplitude train noise

a. Typical reading

T = .24 sec — App = 1 mm @ 72dB
= 0.25 mm @ 60dB
= 0.16 mV

Yi = .0005 mils peak-to-peak
= .0002 mils rms

b. Maximum reading

T = .26 sec — App = 3.5 mm @ 72dB
= .9 mm @ 60dB
= .6 mV

Yi = .0022 mils peak-to-peak
= .0008 mils rms

2. Unknown "spikes," 1-sec duration once every 40-50 sec

T = 1 sec — App = 4 mm @ 72dB
= 1.0 mm @ 60dB
= 0.5 mV

Yi = .014 mils peak-to-peak
= .005 mils rms

larger and more frequent during the daylight hours.

B. May 31, record length 14 hours 2 1/2 minutes gain = 72dB starting at 1137 CDT. Similar to May 30 except noise spikes (item #2) less frequent (one per 90 to 120 seconds). Station was visited twice (1234 and 1919 CDT).

1. Quarry explosion (?), 5-sec duration plus coda

T = 1 sec — App = 4 mm @ 72dB
= 1 mm @ 60dB
= 0.5 mV

Yi = .014 mils peak-to-peak
= .005 mils rms

C. June 1, record length 14 hours 22 minutes, starting at 1630 CDT, gain = 72dB. Similar to May 31 with brief "storm" of noise spikes from 2000 to 2200 hours and distinct reduction in both frequency and amplitude after that. Noise spikes are almost not observable by the end of the record.

1. Quarry explosion 3 to 5 sec duration

T = 0.8 sec — App = 3 mm @ 72dB
= .75 mm @ 60dB
= .38 mV

Yi = .005 mils peak-to-peak
= .002 mils rms

TABLE 7.6—STATION 5, MIDWAY BETWEEN LYNDON AND QUENEMO, T. 17 S., R. 16 E., SEC 10, NE 1/4, 300 M (990 FT) NORTH OF HALF-SECTION LINE ON THE EDGE OF SECTION. Portacorder 040068, S-500 #2

A. May 30, record length 21 hours 22 minutes, starting at 1330 CDT, gain = 72 dB

1. Frequent trains, typical maximum value
   T = .25 sec App = 2.5 mm @ 72dB
   = 0.6 mm @ 60dB
   = 0.4 mV
   Yi = .0014 mils peak-to-peak
   = .0005 mils rms

2. Wind noise (pervasive during day)
   T = 1.0 sec App = 3.0 mm @ 72dB
   = .75 mm @ 60dB
   = .33 mV
   Yi = .010 mils peak-to-peak
   = .004 mils rms

B. May 31, record length 14 hours 16 1/2 minutes, starting at 1114 CDT, gain = 72dB, very windy day

1. Train noise as reported for May 30

2. Wind noise during daylight hours
   T = .9 sec App = 4 mm @ 72dB
   = 1 mm @ 60dB
   Yi = .010 mils peak-to-peak
   = .004 mils rms

C. June 1, record length 14 hours 16 minutes, starting at 1700 CDT

1. Train noise as before

2. Wind noise (typical maximum) during daylight hours
   T = 1 sec App = 6 mm @ 72dB
   = 1.5 mm @ 60dB
   = .75 mV
   Yi = .020 mils peak-to-peak
   = .007 mils rms
   This represents about 2 minutes of the whole record.

TABLE 7.7—STATION 6, QUENEMO, T. 17 S., R. 17 E., SEC. 8, VERY SOUTHEAST CORNER, 160 M (528 FT) NORTH OF SOUTH EDGE; VERY QUIET STATION EXCEPT FOR TRAIN NOISE AND ONE QUARRY EXPLOSION. Portacorder 040041; S-500 #3

A. May 30, record length 14 hours 16 minutes, starting at 1300 CDT, gain = 78 dB. Train noise on ~ 30% of the record

1. Maximum excursions due to trains
   T = .25 sec App = 8 mm @ 78dB
   = 1 mm @ 60dB
   = .63 mV
   Yi = .0022 mils peak-to-peak
   = .0008 mils rms

2. Quarry explosion at about 1430 CDT
   T = .8 sec App = 12 mm @ 78dB
   = 1.5 mm @ 60dB
   = 0.75 mV
   Yi = .008 mils peak-to-peak
   = .003 mils rms

B. May 31, record length 13 hours, starting at 1045 CDT, gain = 72dB; station went down before end of record. Only train noise; no different than May 30 record.

0.8×10^{-3} mils rms at 4 Hz. A single quarry explosion was recorded with maximum vibration excursions of 3×10^{-3} mils rms at 1.25 Hz.

Table 7.8 summarizes the results from a station set upon the median strip of U.S. Highway 75 at the intersection of U.S. 75 with the proposed ring. The station operated about 20 minutes and about 75 vehicles were recorded including four heavy semi-trailer trucks. That is about one vehicle every 16 seconds and one truck every 5 minutes on a Tuesday afternoon. All vibrations were about 5 Hz in frequency and would last 2 to 4 seconds suggesting that the vehicle had to be within 100 to 200 feet of the station to be detected at 72dB gain. Trucks typically had 3.2×10^{-3} mils rms of vibration, light trucks had 1.7×10^{-3} mils rms of vibration, and automobiles had about 1.0×10^{-3} mils rms of vibration.

Figure 7.6 summarizes all measurements for each station as recorded on the ground surface.

Extrapolation of Measurements to Depth

Vibrations on the surface of the earth are larger than they would be at depth under normal conditions. To extrapolate our measurements from the surface to the depth of the collider ring we will assume that the vibrations are Rayleigh wave surface waves. Rayleigh waves are found to attenuate with depth according to the equation $\exp(-5.2\ D/l)$ where D is depth and l is wavelength. This equation is reported by Knapp (1986) and is consistent with measurements made by Dobrin et al. (1951). Because the conditions experienced by Knapp and by Dobrin were very different, both with respect to the field situation and the wavelengths measured, it is considered that the derived relationship is a reasonably good approximation for most situations.

To estimate the wavelengths that represent the frequencies we observed, we relied on the experiences of Dobrin et al. (1951) and Mooney and Bolt (1966) to derive Table 7.9. The estimations are admittedly crude, but the error is expected to be less than 50%.

Figure 7.7 shows the calculated attenuation curves for depths of 200, 400, and 600 feet. Bars show 50% error in the positive direction (the most likely error). This figure, admittedly, is only intended for use when wavelength is greater than depth (upper portion), but again it is a reasonable approximation for deeper values.

Figure 7.8 is a redrawing of Figure 7.6 with vibration values reduced to the depths of 200, 400, and 600 feet, respectively.

Conclusions

In general it is safe to conclude that surface vibrations in the region of the collider ring will be less than 8×10^{-3} mils except perhaps during periods of extreme wind. Wind conditions were at least average for Kansas if not a little extra windy during the period of the measurements, causing background vibrations of 4×10^{-3} mils at one station and 1.4×10^{-3} mils at another station at frequencies of about 1 Hz or less. Peak wind vibrations were 7×10^{-3} and 5×10^{-3} mils, respectively, and were

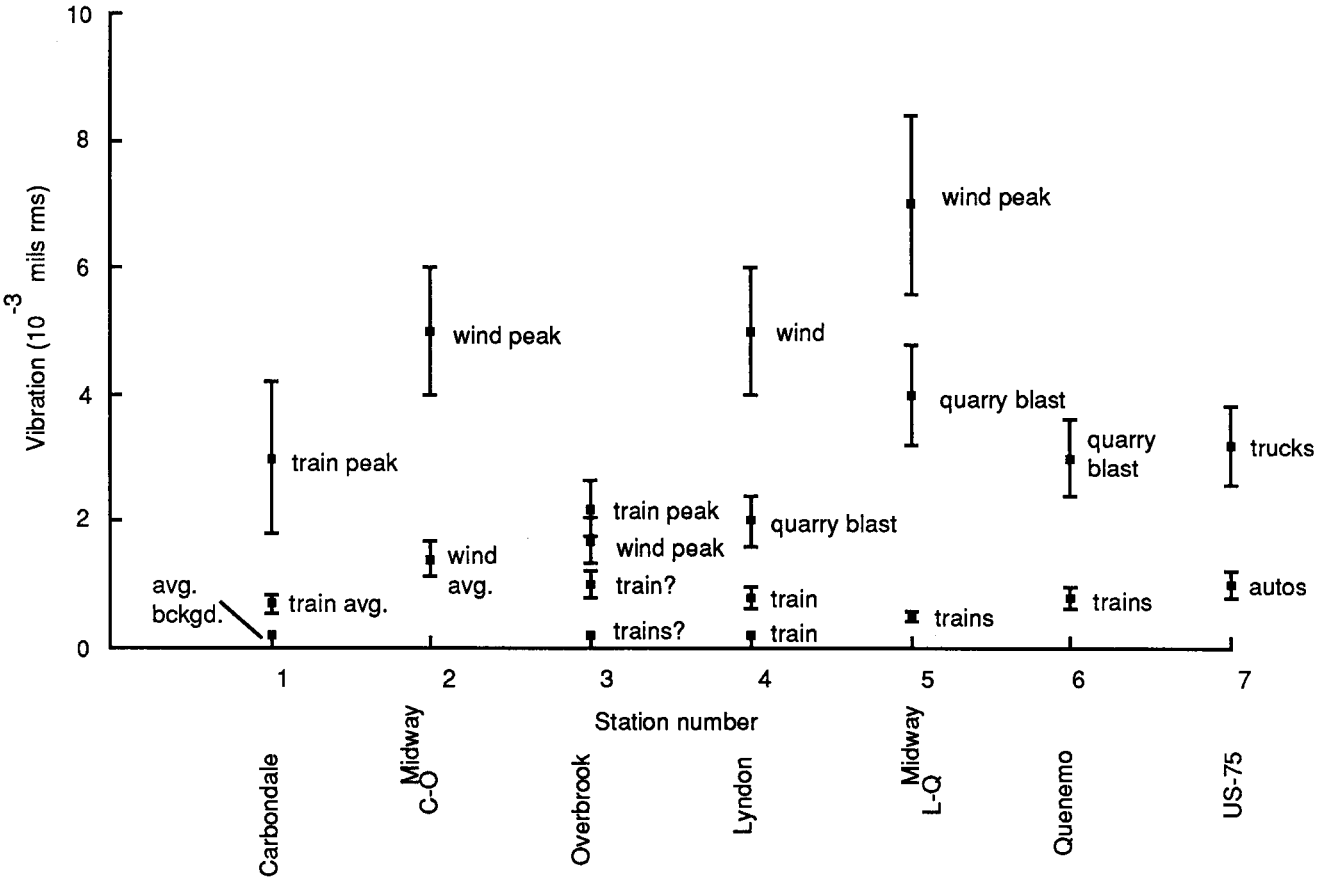


FIGURE 7.6—SUMMARY OF VIBRATION MEASUREMENTS WITH 20 PERCENT ERROR BARS.

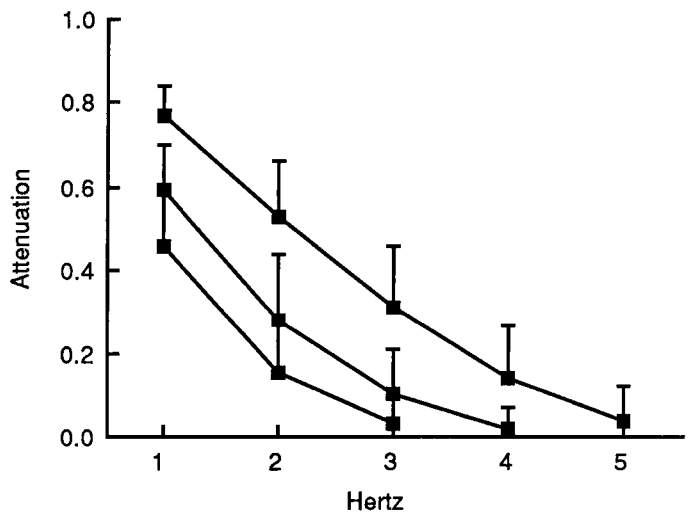


FIGURE 7.7—ATTENUATION OF VIBRATION WITH DEPTH ACCORDING TO THE MODEL OF TABLE 7.8. Error bars constrain the excursion of any reasonable error in the conservative direction.

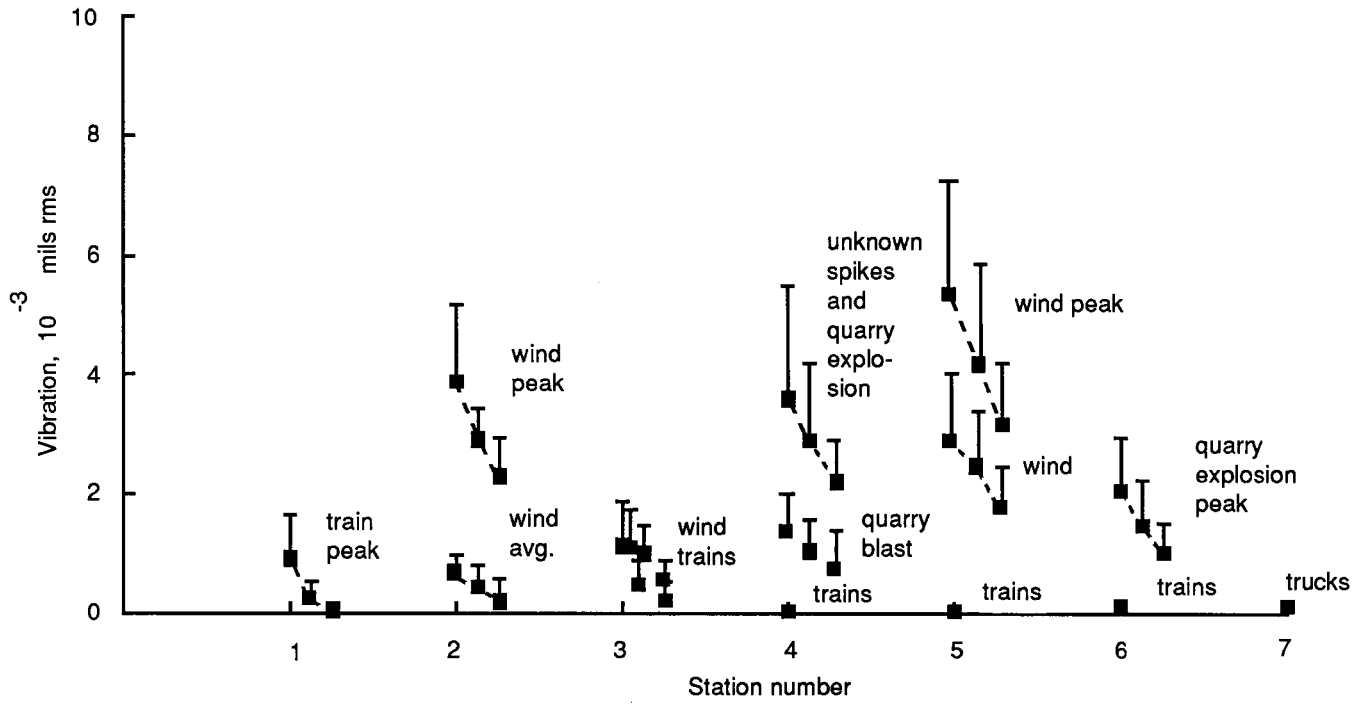


FIGURE 7.8—STATION VIBRATIONS REDUCED TO DEPTHS OF 200, 400, AND 600 FEET, RESPECTIVELY. Error bars show the conservative constraint of the range of expected excursions.

TABLE 7.8—STATION 7, U.S. 75 MEDIAN, T. 14 S., R. 16 E., SEC. 31, NW 1/4 AT INTERSECTION OF PROPOSED RING AND U.S. HIGHWAY 75 . Portacorder #011041; S-500 #1, #2, #3.

A. June 16 (midafternoon), record length 20 minutes, traffic recording from median strip.

1. Trucks
   T = .4 sec App = 16 mm @ 72dB
   = 4 mm @ 60dB
   Yi = .0092 mils peak-to-peak
   = .0032 mils rms

2. Light trucks
   T = .4 sec App = 10 mm @ 72dB
   = 2.5 mm @ 60dB
   Yi = .005 mils peak-to-peak
   = .0017 mils rms

3. Automobiles
   T = .4 sec App = 6 mm @ 72dB
   = 1.5 mm @ 60dB
   Yi = .003 mils peak-to peak
   = .001 mils rms

TABLE 7.9—ESTIMATED WAVELENGTHS AND PHASE VELOCITY FOR DIFFERENT FREQUENCIES.

FREQUENCY(Hz)	λ (Meters)	c(M/Sec)
1	1200	1200
2	500	1000
3	270	810
4	160	640
5	100	500

very short duration excursions (about 2 minutes out of 54 hours of record).

It is interesting that the two stations sensitive to wind shared the same S-500 seismometer. This suggests that these anomalies may be due to a hypersensitivity of the seismometer to low frequencies. Comparison of this seismometer with the other two shows that it may be "unstable," a characteristic problem with this type of seismometer. It is possible that the two sites simply were more wind-sensitive, and it was only coincidence that resulted in the same seismometer being placed there.

The Lyndon region had strange noise spikes of short durations and low frequency (about 1 Hz) with typical rms amplitudes of 5 x 10^{-3} mils, although occasional excursions were larger. These excursions did not correlate with wind noise or local traffic. They did "ebb and flow," however, and had virtually disappeared before the end of the last record. These also may be a seismometer instability problem.

During the course of recording nearly 170 hours of record, only three significant quarry explosions were detected. Surface-wave amplitudes from these explosions were 5 x 10^{-3}, 2 x 10^{-3}, and 3 x 10^{-3} mils at about 1-Hz frequency.

Trains were the most prevalent source of noise in the 3 to 4 Hz range, but had rms vibration amplitudes of less than 2 x 10^{-3} mils with 1 x 10^{-3} mils or less being more typical. At Carbondale, where the station was 0.5 km from the track the peak excursion was 3 x 10^{-3} mils rms. Train traffic was infrequent at Carbondale with three trains detected during nearly 27 hours of recording. Each train was noticeable fewer than 5 minutes on the record at 60dB gain.

Stations 1, 3, 4, and 6 are believed to be the best recordings. Stations 2 and 4 are considered to be suspicious because they were anomalously noisy and shared a common seismometer.

Noise due to vehicular traffic on major highways is judged to be an inconsequential source of vibrational noise, especially at the proposed depth of the ring.

References

Dobrin, M. B., Simon, R. F., and Lawrence, P. L., 1951, Rayleigh waves from small explosions: American Geophysical Union, Transactions, v. 32, no. 6, p. 822-832.

Knapp, R. W., 1986, Geophone differencing to attenuate horizontally propagating noise: Geophysics, v. 51, no. 9, p. 1,743-1,759.

Mooney, H. M., and Bolt, B. A., 1966, Dispersive characteristics of the first three Rayleigh modes for a single surface layer: Bulletin of the Seismological Society of America, v. 56, no. 1, p. 43-67.

Site Proposal for the Superconducting Super Collider

Kansas

Volume 8

Utilities

For more information, contact:

SSC Project Office
Kansas Department of Commerce
400 W. 8th, Suite 500
Topeka, Kansas 66603
(913) 296-5272

Cover art from the original painting "*Explosion of Creation*" by Kansas artist Philomene Bennett

Cover design by Jennifer Sims, Kansas Geological Survey

Contents

8.1 POWER 1
- 8.1.1 Description of Actual and Planned Electric-Power Generating and Transmission Grid Systems 1
- 8.1.2 Map of Regional Transmission Network 5
- 8.1.3 Analysis of Power-system Stability and Discussion of Power Source and Distribution of Grid Reliability 5
- 8.1.4 Utility-rate Schedules 5
- 8.1.5 Projection of Future Power-demand Growth and Costs 5

8.2 INDUSTRIAL COOLING WATER 14
- 8.2.1 Itemization of the Available Sources of Water 14
- 8.2.2 Estimated Cost of Industrial Cooling Water 15
- 8.2.3 Physical and Chemical Properties of the Water Available for use as Industrial Cooling Water 16

8.3 POTABLE WATER 16
- 8.3.1 Sources of Water Available for Use as Potable Water 16
- 8.3.2 Estimates of the Present and Projected Cost of Potable Water 17

8.4 FUEL 17
- 8.4.1 How Fuel Heating/Cooling Requirements Will Be Met 17
- 8.4.2 Cost of Fuel Supply in $/MBTU 18

8.5 WASTE AND SEWAGE DISPOSAL 19
- 8.5.1 Available Treatment Facilities 19
- 8.5.2 Solid Waste 19

Tables

8.1—Kansas Power and Light electrical-generating stations 3

8.2—Kansas City Power and Light electrical-generating stations 4

8.3—KPL historical data, availability/forced outage rates through December 1986 6

8.4—KCPL historical data, availability/forced outage rates through December 1986 7

8.5—Historic availability and reliability of transmission system 8

8.6—KPL projected demand and energy growth, both with and without project 12

8.7—KCPL projected demand and energy growth, both with and without project 13

8.8—Major rural water districts in the collider area 15

8.9—Representative characteristics of water supplies for collider 16

8.10—Selected hazardous-waste managment facilities regularly utilized by Kansas hazardous-waste generators 21

Figures

8.1—Electrical transmission and generating facilities for the SSC region 1

8.2—Three-phase fault at Wolf Creek, removing Substation II first 9

8.3—Three-phase fault at Wolf Creek, removing Wolf Creek-LaCygne first 9

8.4—Three-phase fault at Jeffery-Auburn, 230 kV 10

8.5—Three-phase fault at Jeffery-East Manhattan, 230 kV 10

8.6—Three-phase fault at LaCygne, removing LaCygne-W. Gardner first 11

8.7—Three-phase fault at LaCygne, removing LaCygne-Wolf Creek first 11

8.8—Existing and proposed gas transmission lines 18

8.9—Existing sanitary landfills in Osage, Shawnee, and Douglas counties 20

Appendices

1—Kansas Corporation Commission contingent approval of utility-rate structures

2—Kansas Power and Light rate schedule, covering Substation I

3—Kansas City Power and Light rate schedule, covering Substation II

4—Memorandum of understanding between the State of Kansas and the City of Topeka concerning the water supply for the SSC

5—Kansas Power and Light rate schedule, large-customer gas service

Volume 8—Utilities

8.1 POWER

8.1.1 Description of Actual and Planned Electric-Power Generating and Transmission Grid Systems

Safe, reliable, and ample electric service will be provided to the Superconducting Super Collider (SSC) site in Kansas by the state's two largest electric-utility companies—the Kansas Power and Light Company (KPL) and the Kansas City Power & Light Company (KCPL). KPL will serve Substation I and KCPL will serve Substation II. Each utility has at least 12 times more generating capacity than the SSC's peak requirement. The two utilities also offer a mix of coal- and nuclear-generated power, which not only reinforces reliability, but also fosters long-term stability in electricity prices for the SSC.

In addition, both utilities have long-term contracts for low-cost, low-sulfur western coal, and both are well positioned to meet the standards of pending acid-precipitation legislation. These facts also help stabilize prices.

The proposed Super Collider site lies in the center of a large 345-kV transmission grid (Figure 8.1) and is within a short distance of several major generating facilities. Hence, electricity will come into the site from several nearby interconnecting sources, increasing both reliability and efficiency.

Figure 8.1 is a regional map illustrating the generating and bulk-transmission facilities in the vicinity of the proposed SSC site and also includes lines the utilities propose to build to serve the SSC. For greater clarity, the map shows only those lines 161 kV and above which affect the SSC service.

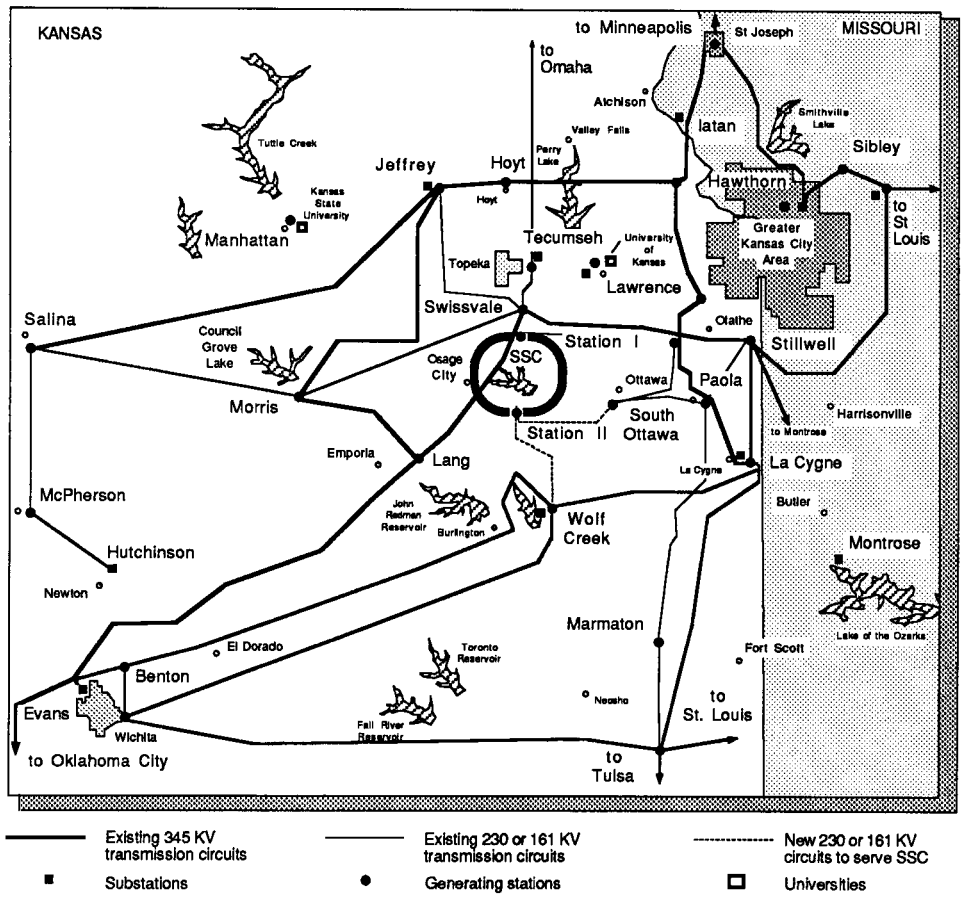


FIGURE 8.1—ELECTRICAL TRANSMISSION AND GENERATING FACILITIES FOR THE SSC REGION.

To serve Substation I, KPL proposes rerouting the existing 230-kV Morris/Swissvale line and routing it directly from the Morris Substation to the SSC Substation I. KPL also will build a second 230-kV line from Swissvale to the SSC Substation I, thus providing a dual 230-kV supply. Each feed would terminate in a highly reliable ring bus. KCPL will also provide two feeds to Substation II: a 161-kV line from Wolf Creek Generating Station and a 161-kV line from the South Ottawa Substation.

Such a design would mean that SSC Substations I and II would have the enhanced reliability provided by dual feeds coming from independent sources and independent utilities, all tightly interconnected with the balance of the shared reserve capacity of the MOKAN Power Pool (MOKAN), of which KPL and KCPL are both members. MOKAN, which currently has 11,863 MW of capacity, comprises utilities in western Missouri and throughout Kansas. Both KPL and KCPL are active members of the Southwest Power Pool (SWPP), which is a region of the National Electric Reliability Council (NERC). The SWPP is composed of 39 utilities in seven states with a combined generating capacity of nearly 65,000 megawatts.

KPL's present generating capacity of 2,505 megawatts is produced using an annual system-fuel mix of 99 percent coal and 1 percent natural gas. The company has contracts for a low-cost, low-sulfur coal supply adequate to meet projected needs well into the 21st century. Each of KPL's generating stations fulfills, and indeed surpasses, all current environmental standards, as well as the standards proposed in pending "acid rain" bills in Congress.

KPL's generating stations, all of which are in Kansas, are located at Topeka (Tecumseh), Lawrence, Hutchinson, and the Jeffrey Energy Center, 26 miles northwest of Topeka. Also, a KPL combustion turbine is located immediately south of Abilene, Kansas. KPL owns 64 percent of each of the three identical 680-megawatt (net) units at the Jeffrey generating station and 100 percent of each of the other generating stations.

In addition, KPL currently plans to bring on line a fourth unit at Jeffrey, identical to the three other units, in 1997. In preparation for that event, KPL already owns the land and has prepared for the necessary permits, water supply, and other requirements to operate that unit. KPL could bring this unit on-line before 1997 without untimely delay, if necessary.

KCPL's present generating capacity is 2,937 megawatts. The 1986 system generation was produced with a fuel mix of 25.6 percent nuclear, 73.8 percent coal, 0.4 percent oil, and 0.2 percent natural gas.

The Wolf Creek Generating Station, a 1,128-MW nuclear plant, is located about 24 miles south of the SSC Substation II site. KCPL owns 47 percent, or 530 MW, of this unit. Wolf Creek's outstanding performance has exceeded industry standards and set a U.S. record for production during its first year of commercial operation.

A total of 2,037 MW of coal-fired generation is supplied by KCPL from four generating stations. LaCygne Station at LaCygne, Kansas, has two units totaling 1,316 MW capacity, of which KCPL owns 50 percent, or 658 megawatts. Iatan Station at Weston, Missouri, is a 670-MW unit, with KCPL's 70-percent share providing 469 megawatts of capacity. The Iatan site was designed for additional generating units in the future.

KCPL has 100 percent ownership of stations at Montrose, Missouri, and Kansas City, Missouri (Hawthorn). Three coal-fired units at Montrose total 460 MW, and one coal-fired unit at Hawthorn is rated at 450 MW. KCPL has modified both of these stations to change the coal supply to low-sulfur coal. With these modifications, the KCPL system now meets proposed requirements of pending Federal acid-rain legislation.

KCPL also owns 370 megawatts of oil-fired combustion turbines installed at the Northeast Generating Station in Kansas City.

The location of both KPL's and KCPL's generating stations and other information is detailed in Tables 8.1 and 8.2 and Figure 8.1.

Both KPL and KCPL have dispatch centers equipped with state-of-the-art energy-management systems that are staffed 24-hours/day. This means additional reliability and price stability from generation available from the utilities' systems and through their interconnections with MOKAN and the Southwest Power Pool. In addition to economical energy exchange, the highly sophisticated, computerized energy-management systems provide immediate identification of problems anywhere on the grid, which facilitates quick repair.

The ample generating capacities of KPL and KCPL, their association with MOKAN and SWPP, and the extensive existing interconnection system surrounding the proposed SSC site verify the ability of the utilities to meet both the ordinary and extraordinary needs of the SSC project.

At DOE's option, KPL and KCPL are prepared to contract with DOE to build, own, and maintain Substations I and II, the campus-distribution system, and the 69-kV above-ground perimeter distribution and substations (as detailed in Option B in SSC Conceptual Design, Attachment C, Conventional Facilities, p. 9-6.) The costs and details of this proposal are given in Section 8.1.4 and referred to as Service Option B. This option would allow the Department of Energy to reduce its initial site-investment costs and reduce the operating and maintenance costs throughout the SSC's lifetime. With the utilities providing 24-hour surveillance and maintenance service, reliability would be enhanced while the costs are reduced.

TABLE 8.1--KANSAS POWER AND LIGHT ELECTRICAL-GENERATING STATIONS.

Unit	Fuel	Commercial Operation	Planned Retirement	1987 Accred. Cap. MW	1988 Accred. Cap. MW	1992 Accred. Cap. MW	1995 Accred. Cap. MW	1997 Accred. Cap. MW	2003 Accred. Cap. MW	2004 Accred. Cap. MW	2005 Accred. Cap. MW
Tecumseh 7	Coal	1957	After 2006*	77	77	77	77	77	77	77	77
Tecumseh 8	Coal	1962	After 2006*	122	142	142	142	142	142	142	142
Tecumseh CT 1	Gas/Oil	1972	After 2006*	19	19	19	19	19	19	19	19
Tecumseh CT 2	Gas/Oil	1972	After 2006*	19	19	19	19	19	19	19	19
Lawrence 1	Coal	1939	1997	I.R.	I.R.	7	7	RT	RT	RT	RT
Lawrence 2	Gas/Oil	1952	After 2006*	I.R.	I.R.	26	26	RT	RT	RT	RT
Lawrence 3	Coal	1954	After 2006*	53	53	53	53	53	53	53	53
Lawrence 4	Coal	1960	After 2006*	107	107	107	107	107	107	107	107
Lawrence 5	Coal	1971	After 2006*	330	330	330	330	330	330	330	330
Hutchinson 1	Gas/Oil	1950	1997*	I.R.	I.R.	I.R.	20	RT	RT	RT	RT
Hutchinson 2	Gas/Oil	1950	1997*	I.R.	I.R.	I.R.	17	RT	RT	RT	RT
Hutchinson 3	Gas/Oil	1951	1997*	I.R.	I.R.	I.R.	27	RT	RT	RT	RT
Hutchinson 4	Gas/Oil	1965	After 2006*	190	190	190	190	190	190	190	190
Hutchinson CT 1	Gas/Oil	1974	After 2006*	50	50	50	50	50	50	50	50
Hutchinson CT 2	Gas/Oil	1974	After 2006*	50	50	50	50	50	50	50	50
Hutchinson CT 3	Gas/Oil	1974	After 2006*	50	50	50	50	50	50	50	50
Hutchinson CT 4	Oil	1975	After 2006*	80	80	80	80	80	80	80	80
Abilene CT 1	Gas/Oil	1973	After 2006*	68	68	68	68	68	68	68	68
Jeffrey 1	Coal	1978	After 2006	425	415	415	400	400	355	355	355
Jeffrey 2	Coal	1980	After 2006	430	430	420	405	405	385	385	360
Jeffrey 3	Coal	1983	After 2006	435	435	435	425	425	390	390	390
Jeffrey 4	Coal	1997	After 2006	---	---	---	---	435	435	435	435
Future CT	Gas/Oil	2003	After 2006	---	---	---	---	---	50	50	50
Future CT	Gas/Oil	2004	After 2006	---	---	---	---	---	---	50	50
Future CT	Gas/Oil	2005	After 2006	---	---	---	---	---	---	---	50
System Total				2505	2515	2538	2562	2900	2850	2900	2925

Notes: I.R. = Inactive Reserve
RT = Retired
* = Life extension efforts required to exceed stated book life of this unit (33 years for steam units and 20 years for combustion turbines).

TABLE 8.2—KANSAS CITY POWER AND LIGHT ELECTRICAL GENERATING STATIONS.

Unit	Notes	Fuel	Commercial Operation	Planned Retirement	1987 Accred. Cap. MW	1994 Accred. Cap. MW	1996 Accred. Cap. MW	2001 Accred. Cap. MW
Wolf Creek 1	1	Nuclear	1985	After 2006	530	530	530	530
LaCygne 1	2	Coal	1973	After 2006	343	343	343	343
LaCygne 2	3	Coal	1977	After 2006	315	315	315	315
Iatan 1	4	Coal	1980	After 2006	469	469	469	469
Hawthorn 1	5	Coal	1951	After 2006	I.R.	55	55	55
Hawthorn 2	5	Coal	1951	After 2006	I.R.	55	55	55
Hawthorn 3	5	Coal	1953	After 2006	I.R.	I.R.	70	70
Hawthorn 4	5	Coal	1955	After 2006	I.R.	I.R.	70	70
Hawthorn 5		Coal	1969	After 2006	450	450	450	450
Montrose 1		Coal	1958	After 2006	150	150	150	150
Montrose 2		Coal	1960	After 2006	150	150	150	150
Montrose 3		Coal	1964	After 2006	160	160	160	160
Northeast CT 11		Oil	1972	After 2006	42	42	42	42
Northeast CT 12		Oil	1972	After 2006	43	43	43	43
Northeast CT 13		Oil	1976	After 2006	47	47	47	47
Northeast CT 14		Oil	1976	After 2006	48	48	48	48
Northeast CT 15		Oil	1975	After 2006	47	47	47	47
Northeast CT 16		Oil	1975	After 2006	48	48	48	48
Northeast CT 17		Oil	1977	After 2006	47	47	47	47
Northeast CT 18		Oil	1977	After 2006	48	48	48	48
New Unit	6	Coal	2001	After 2006	--	--	--	325
System Total					2937	3047	3187	3512

Notes:
(1) KCPL 47% owner of 1128 MW unit.
(2) KCPL 50% owner/operator of 686 MW unit.
(3) KCPL 50% owner/operator of 630 MW unit.
(4) KCPL 70% owner/operator of 670 MW unit.
(5) Unit presently on inactive reserve.
(6) KCPL 50% owner/operator of 650 MW unit.

8.1.2 Map of Regional Transmission Network

See Figure 8.1.

8.1.3 Analysis of Power-system Stability and Discussion of Power Source and Distribution-Grid Reliability

As previously discussed in Section 8.1.1, service to the SSC will be enhanced by installing dual-transmission lines directly into both Substations I and II.

Overall, the KPL and KCPL generating units have excellent availability and low forced-outage rates when compared with the national average (see Tables 8.3 and 8.4) based on NERC generator-availability data-system reports. Both companies have equally impressive figures detailing transmission-system historic availability and reliability, as illustrated in Table 8.5.

In accordance with the Invitation for Site Proposals, the companies conducted steady-state, single-contingency evaluations of grid stability by simulating outages of the major bulk-transmission lines and other facilities expected to impact service to the SSC. For Substation I, the worst case would be an outage of the Jeffrey to Hoyt 345-kV line, resulting in a drop in voltage of 0.9 percent to 100.2-percent voltage at the 230-kV bus at the SSC. For Substation II, the worst condition was a voltage drop of 2.8 percent to 99.8-percent voltage caused by an outage of the Wolf Creek to Substation II 161-kV line.

Both of these worst-case condition studies provide evidence of the strength of the generation and transmission system, since a deviation of up to 5 percent from the norm is considered acceptable within the industry.

To determine worst-case transient-stability conditions, the utilities simulated three-phase faults at three of the large generating stations near the SSC site. All of the generating units exhibited stable operation with generator-rotor angles in the process of returning to their pre-fault condition within 90 cycles or 1.5 seconds after the fault occurred (see Figures 8.2 through 8.7).

The utilities based these load-flow and stability cases on large data bases established by members of the SWPP for the year 1996.

In summary, historical data and recent evaluations indicate the generation and power-delivery system that will serve the SSC is highly stable and reliable.

8.1.4 Utility-rate Schedules

The Kansas utilities and the State's utility-regulatory agency (Kansas Corporation Commission) have combined efforts to provide the SSC with unsubsidized but highly competitive power rates. Such rates are extended only to qualifying large customers that assure a continuous load. These rate schedules reflect lower unit-costs associated with service to an industrial customer such as the SSC and have the contingent approval of the Kansas Corporation Commission (appendix 1, volume 8). This order provides assurance that if Kansas is selected as the preferred SSC site, the utility-rate structures have been identified and have the approval of the State's regulatory agency.

Substation I

As previously noted, Substation I will be served by KPL. The attached rate schedule (appendix 2, volume 8) represents the full current cost to serve an industrial load such as the SSC. This rate schedule includes a capacity charge, an energy charge, and a special-facilities charge. Under the Base Concept for service to Substation I, KPL estimates that in present-day dollars it will install $1,340,000 in special facilities, with a resulting special facilities charge of $23,450 per month. Should DOE choose option B and contract with KPL to build, own, and maintain above-ground facilities, KPL estimates the special facilities to be installed will cost $13,470,000, with a monthly charge of $235,725.

Substation II

Substation II will be served by KCPL. The attached rate schedule (appendix 3, volume 8) represents its full current cost to serve a load such as the SSC. This rate schedule includes a capacity charge, an energy charge, and a special-facilities charge.

As indicated under the Base Concept for service to Substation II, KCPL estimates it will not install any special facilities. Consequently, no special-facilities charge will be applicable. Under Service Option B, KCPL estimates that the special facilities to be installed will cost $8,190,000 in present-day dollars, with an estimated monthly charge of $143,325.

8.1.5 Projection of Future Power-demand Growth and Costs

KPL and KCPL annually prepare demand and energy forecasts. They also evaluate and project the need for new generating capacity each year. Those evaluations, made in conjunction with area utilities, include jointly owned facilities common to the area.

While the SSC is a major project with significant power-demand requirements, the facility would have minimal impact upon either utility's system. As shown in Tables 8.6 and 8.7, projected demand from the SSC

TABLE 8.3--KPL HISTORICAL DATA**, AVAILABILITY/FORCED OUTAGE RATES THROUGH DECEMBER 1986.

Unit	Historical* (AF) (EAF)	Historical* (FOR) (EFOR)	1986 (AF) (EAF)	1986 (FOR) (EFOR)	1985 (AF) (EAF)	1985 (FOR) (EFOR)	1984 (AF) (EAF)	1984 (FOR) (EFOR)	1983 (AF) (EAF)	1983 (FOR) (EFOR)	1982 (AF) (EAF)	1982 (FOR) (EFOR)	1976-1985 National Averages Equivalent Units (AF) (EAF)	1976-1985 National Averages Equivalent Units (FOR) (EFOR)
Jeffrey 1	83.9	4.2	88.4	0.3	75.0	2.0	85.0	4.4	88.9	1.1	85.9	3.6	78.36	10.50
	79.7	5.7	87.9	0.6	74.2	2.9	76.3	12.2	83.0	4.3	77.4	8.5	72.76	16.27
Jeffrey 2	86.5	4.0	88.1	0.4	87.6	3.4	88.4	2.9	89.6	1.6	88.4	2.8	78.36	10.50
	83.4	6.0	87.1	1.3	82.1	8.3	85.3	6.1	82.2	6.3	80.2	3.2	72.76	16.27
Jeffrey 3	88.1	1.4	91.2	2.2	91.0	1.1	80.8	1.1	90.5	1.1	0.0	0.0	78.36	10.50
	85.3	3.3	90.4	2.0	90.1	2.0	76.7	5.3	83.2	5.3	0.0	0.0	72.76	16.27
Tecumseh CT 1	91.7	20.4	100.0	0.0	100.0	0.0	96.7	90.9	98.8	31.4	75.1	96.1	89.71	53.59
	94.1	68.1	100.0	0.0	100.0	0.0	96.7	90.9	98.8	31.4	75.1	96.1	89.31	56.47
Tecumseh CT 2	94.2	22.9	100.0	0.0	100.0	0.0	100.0	2.6	95.0	41.9	83.5	0.0	89.71	53.59
	95.7	29.6	100.0	0.0	100.0	0.0	100.0	2.6	95.0	41.9	83.5	0.0	89.31	56.47
Tecumseh 7	88.3	3.5	89.3	6.3	86.7	3.8	74.9	15.4	77.0	16.5	89.0	5.3	85.18	6.64
	76.7	17.2	88.3	7.0	82.6	9.6	66.4	27.0	60.9	28.5	85.2	9.6	83.39	8.90
Tecumseh 8	81.9	8.0	85.9	13.3	75.9	10.2	68.7	21.0	74.2	7.4	81.7	16.8	83.22	7.49
	67.1	20.2	79.5	36.4	66.3	17.3	60.5	25.2	71.2	10.6	58.0	21.0	80.21	10.87
Hutchinson CT 1	92.4	4.9	100.0	0.0	98.1	73.3	84.7	37.3	79.2	0.0	99.2	2.1	83.63	48.93
	92.2	22.0	100.0	0.0	98.1	73.3	84.7	37.3	79.2	0.0	99.2	2.1	82.89	53.98
Hutchinson CT 2	90.9	37.2	99.7	0.0	99.4	0.0	99.9	0.0	99.2	9.0	76.8	4.7	83.63	48.93
	95.0	7.4	99.7	0.0	99.4	0.0	99.9	0.0	99.2	9.0	76.8	4.7	82.89	53.98
Hutchinson CT 3	92.7	15.4	99.4	76.3	100.0	0.0	98.7	7.8	100.0	0.6	99.3	39.5	83.63	48.93
	99.5	13.3	99.4	76.3	100.0	0.0	98.7	7.8	100.0	0.6	99.3	39.5	82.89	53.98
Hutchinson CT 4	90.4	20.3	100.0	0.0	96.2	0.0	98.9	0.0	99.1	2.2	83.0	98.0	83.63	48.93
	95.4	76.2	100.0	0.0	96.2	0.0	98.9	0.0	99.1	2.2	83.0	98.0	82.89	53.98
Hutchinson 4	92.9	0.4	91.8	0.1	94.3	0.0	92.1	0.7	83.6	2.6	92.2	0.0	84.93	5.23
	87.7	3.4	91.5	2.1	96.2	0.0	89.9	1.1	75.7	10.3	87.3	1.2	83.28	7.30
Lawrence 3	91.1	1.1	91.1	13.2	94.9	0.3	80.8	0.7	67.2	25.2	67.7	21.3	85.18	6.64
	79.5	9.8	90.9	13.2	94.4	0.4	80.3	1.1	66.6	27.5	65.6	29.1	83.39	8.90
Lawrence 4	91.2	1.4	92.7	0.7	91.2	0.8	80.0	8.3	78.9	17.3	88.0	5.2	83.22	7.49
	81.5	8.2	92.2	0.8	88.9	2.7	73.6	10.5	73.1	18.1	80.0	11.0	80.21	10.87
Lawrence 5	87.3	2.2	88.8	1.1	81.5	6.9	89.2	2.1	90.2	1.7	91.5	0.4	77.66	11.08
	80.2	5.4	85.8	3.8	76.4	11.4	83.6	3.6	75.9	6.4	79.4	2.0	72.19	17.03
Abilene CT 1	84.1	46.3	96.4	85.8	86.1	97.9	94.9	77.5	99.1	5.5	98.8	0.0	83.63	48.93
	95.1	66.5	96.4	85.8	86.1	97.9	94.9	77.5	99.1	5.5	98.8	0.0	82.89	53.98

(*) (EAF) and (EFOR) historical since 1932--(AF) and (FOR) historical since 1958
(**) All readings in percent of effective full-power hours

(AF) Availability factor, (EAF) Equivalent availablity factor
(FOR) Forced outage rate, (EFOR) Equivalent forced outage rate

KPL Gas Service operates and maintains all its generating units and has an enviable record, as can be noted by comparing to the National Average Column. All definitions and data collection is in accordance with established National Electric Reliability Council Guidelines (NERC).

TABLE 8.4–KCPL HISTORICAL DATA**, AVAILABILITY/FORCED OUTAGE RATES THROUGH DECEMBER 1986.

Unit	Historical* (AF) (EAF)	Historical* (FOR) (EFOR)	1986 (AF) (EAF)	1986 (FOR) (EFOR)	1985 (AF) (EAF)	1985 (FOR) (EFOR)	1984 (AF) (EAF)	1984 (FOR) (EFOR)	1983 (AF) (EAF)	1983 (FOR) (EFOR)	1982 (AF) (EAF)	1982 (FOR) (EFOR)	1976-1985 National Equivalent Averages Units (AF) (EAF)	1976-1985 National Equivalent Averages Units (FOR) (EFOR)
Wolf Creek 1	73.29	4.85	73.29	4.85									65.24	17.45
	75.53	7.02	75.53	7.02									62.06	20.39
LaCygne 1	51.23	35.92	63.59	29.99	71.55	15.66	63.26	23.97	11.84	78.48	45.92	31.50	78.36	10.50
	39.57	51.99	51.38	44.22	58.85	34.49	49.20	40.56	8.44	84.67	29.97	56.03	72.76	16.27
LaCygne 2	83.43	4.54	80.07	4.28	70.33	3.37	82.48	9.73	94.92	2.15	89.34	3.17	78.36	10.50
	74.79	14.71	73.21	12.70	60.82	17.04	69.67	23.47	86.04	11.30	84.20	9.02	72.76	16.27
Iatan 1	90.33	2.82	90.53	2.79	90.08	3.57	92.72	1.69	91.70	4.06	86.60	2.01	78.36	10.50
	86.58	6.79	86.26	7.39	87.15	6.50	87.30	7.39	88.61	7.29	83.60	5.40	72.76	16.27
Hawthorn 5	75.36	13.89	87.21	2.83	85.62	7.29	68.80	5.68	76.08	16.44	59.10	37.21	78.35	9.84
	65.19	24.68	82.25	8.60	79.51	13.58	65.75	10.08	55.90	36.35	42.53	54.78	72.97	15.61
Montrose 1	84.16	11.85	93.28	11.09	79.91	10.40	84.23	9.66	90.71	6.66	72.69	21.44	83.22	7.49
	81.79	15.06	91.55	14.11	75.17	16.93	83.11	11.01	88.02	9.91	71.08	23.32	80.21	10.87
Montrose 2	81.44	8.83	76.09	4.75	85.61	15.95	86.04	7.80	84.41	8.18	75.04	7.46	83.22	7.49
	80.43	10.02	75.66	5.30	85.31	16.31	85.00	9.16	82.24	10.81	73.92	8.53	80.21	10.87
Montrose 3	88.65	4.49	96.18	4.56	88.48	4.50	96.56	3.31	70.73	6.64	91.29	3.43	83.22	7.49
	87.65	5.70	95.74	5.10	88.12	4.95	96.05	3.89	69.04	9.18	89.30	5.36	80.21	10.87

*Historical rates for 1982-1986 inclusive.
**All readings in percent of effective full-power hours.

(AF) Availability factor
(EAF) Equivalent availability factor
(FOR) Forced outage rate
(EFOR) Equivalent forced outage rate

TABLE 8.5--HISTORIC AVAILABILITY AND RELIABILITY OF TRANSMISSION SYSTEM

Outage Analysis		1960-1986 Statistics							Forced Outage Rate		
		Total	Outages Per Year	Per Year Per 100 miles	Hours spent in outage	MTTF	MOD MTTR	%AVAIL	RATIO	DYR	INDEX
345 KV	11 Circuits Total	45			824.7						
	Average		0.9	2.2		13809	18.3	99.867	.0013	0.484	0.080
230 KV	16 Circuits Total	138			4177.9						
	Average		0.8	2.6		11466	30.3	99.775	.0022	0.821	0.137
161 KV	15 Circuits Total	149			1296.3						
	Average		0.7	99.1		13551	8.7	99.936	.0006	0.234	0.031
115 KV	257 Circuits Total	2386			12346.4						
	Average		0.9	28.1		11967	5.2	99.958	.0004	0.152	0.005
69 KV	122 Circuits Total	1127			3694.8						
	Average		1.1	66.4		11356	3.3	99.972	.0003	0.102	0.013

Notes:

P = Length of observation period, in hours.
D = Time spent in outage measured in hours.
N = Number of outages.
MOD = Mean outage duration = D / N = MTTR = Mean time to recovery
MTTF = Mean time to failure = (P - D) / N
% AVAIL. = Availability = (P - D) / P
RATIO = Forced outage duration = D / P
DYR = Ratio as days per year = (RATIO * 8760) / 24
INDEX = DYR per 100 miles = (DYR * 100) / M

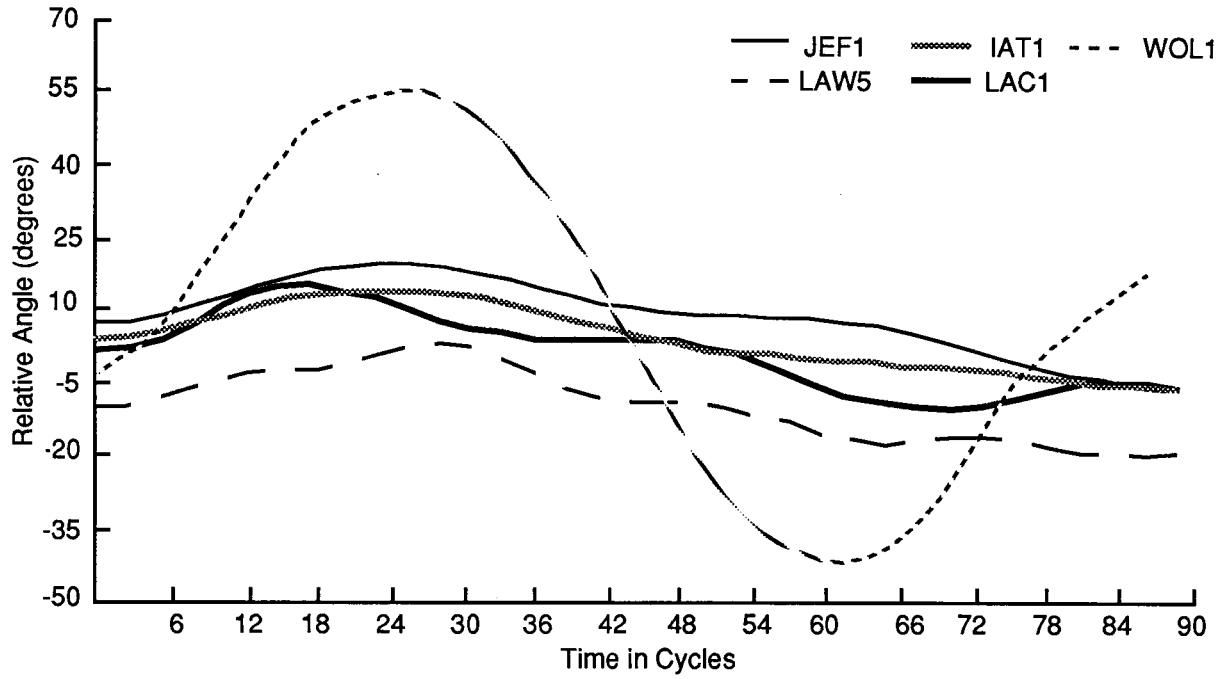


FIGURE 8.2—THREE-PHASE FAULT AT WOLF CREEK, REMOVING SUBSTATION II FIRST.

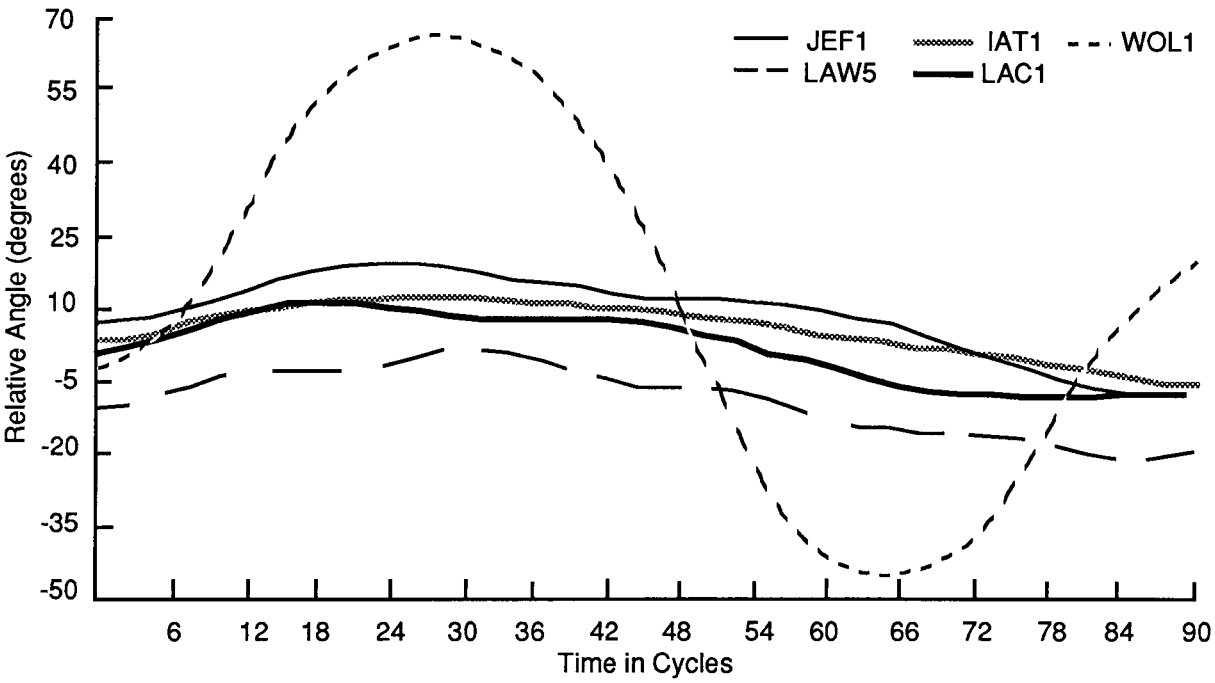


FIGURE 8.3—THREE-PHASE FAULT AT WOLF CREEK, REMOVING WOLF CREEK-LACYGNE FIRST.

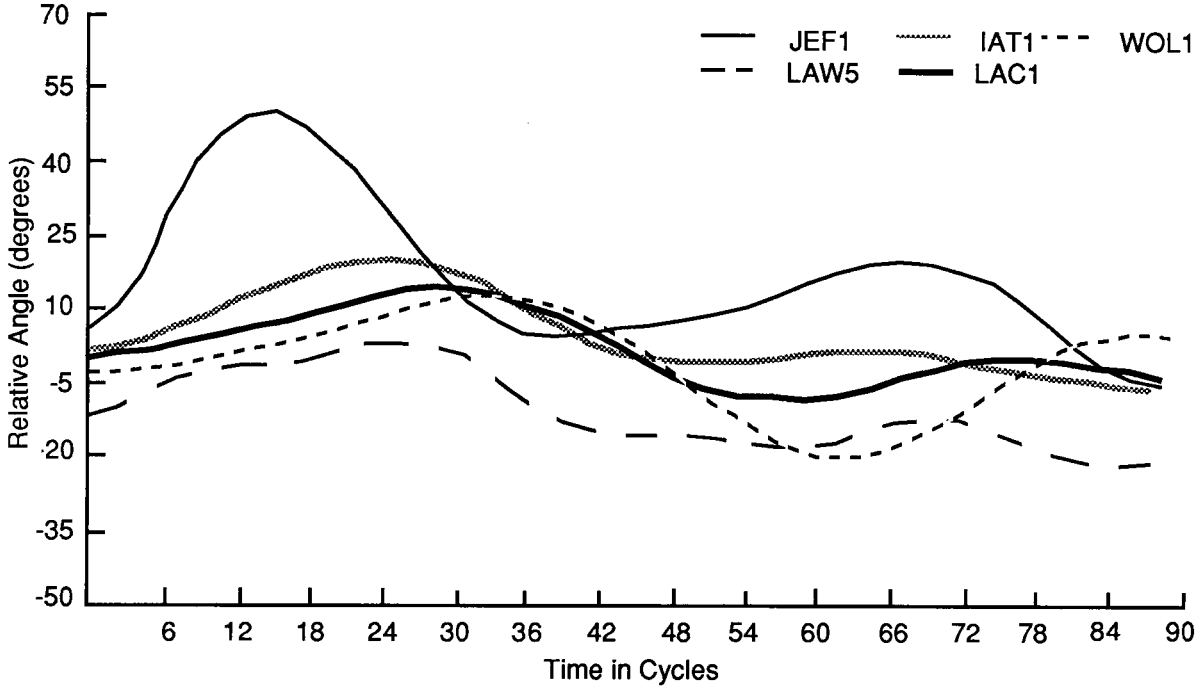


FIGURE 8.4—THREE-PHASE FAULT AT JEFFERY-AUBURN, 230 KV.

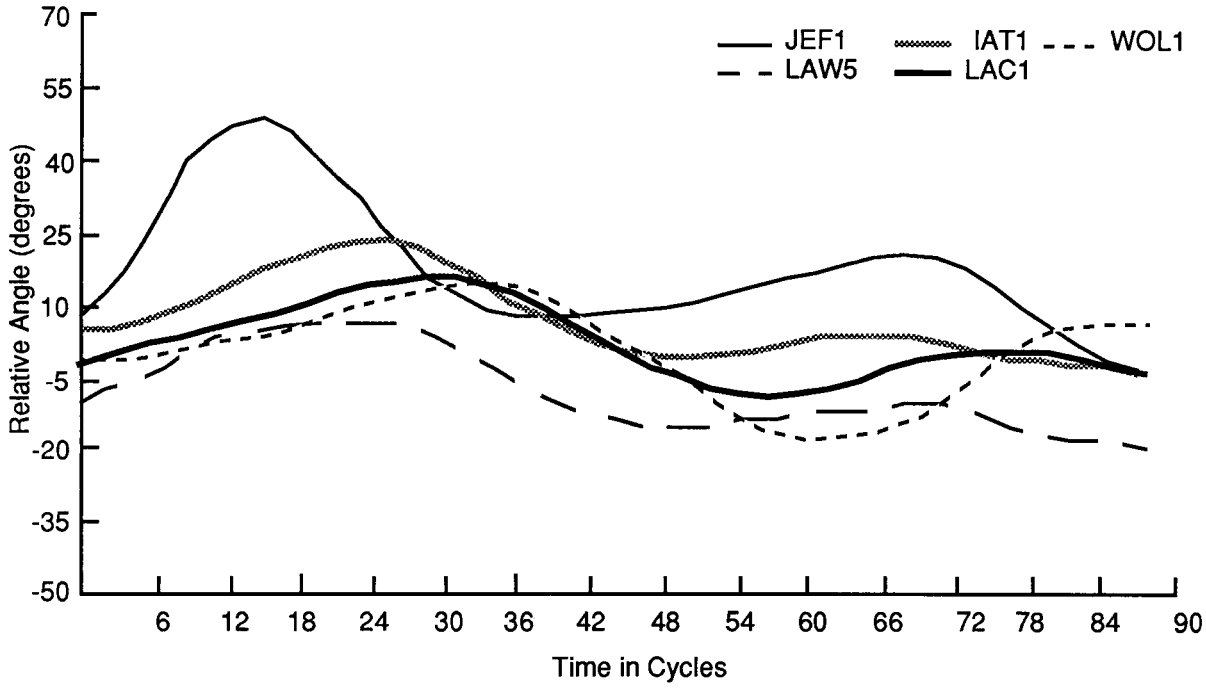


FIGURE 8.5—THREE-PHASE FAULT AT JEFFERY-EAST MANHATTAN, 230 KV.

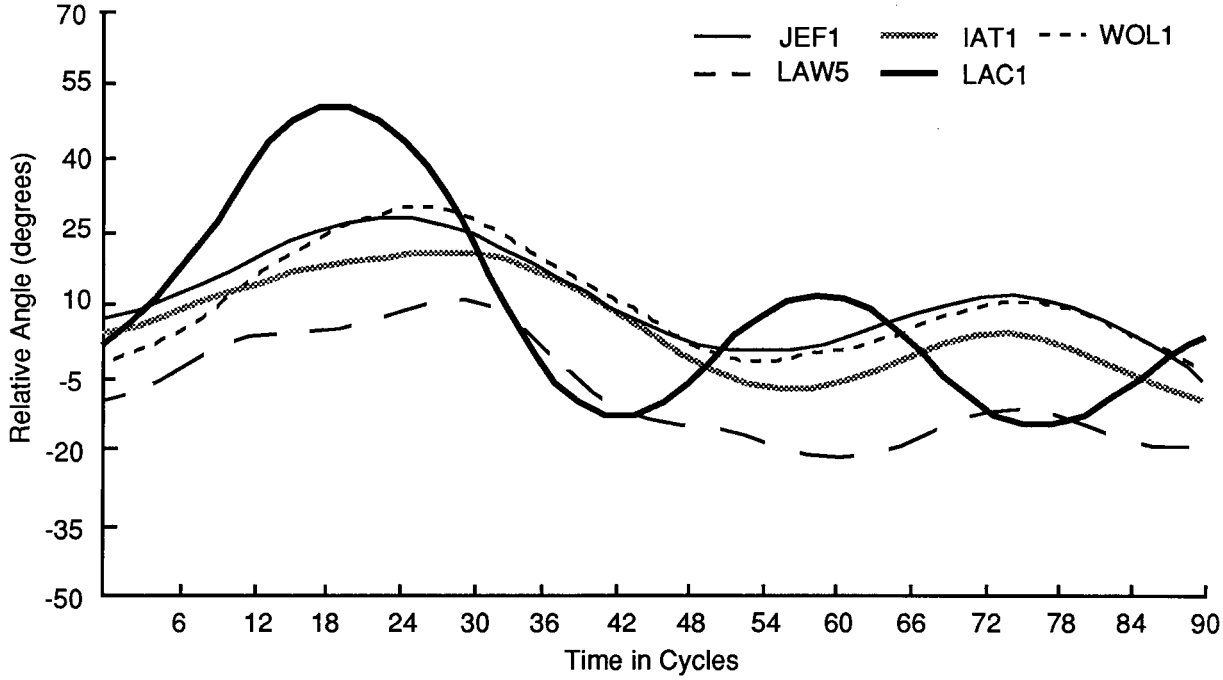


FIGURE 8.6—THREE-PHASE FAULT AT LACYGNE, REMOVING LACYGNE-W. GARDNER FIRST.

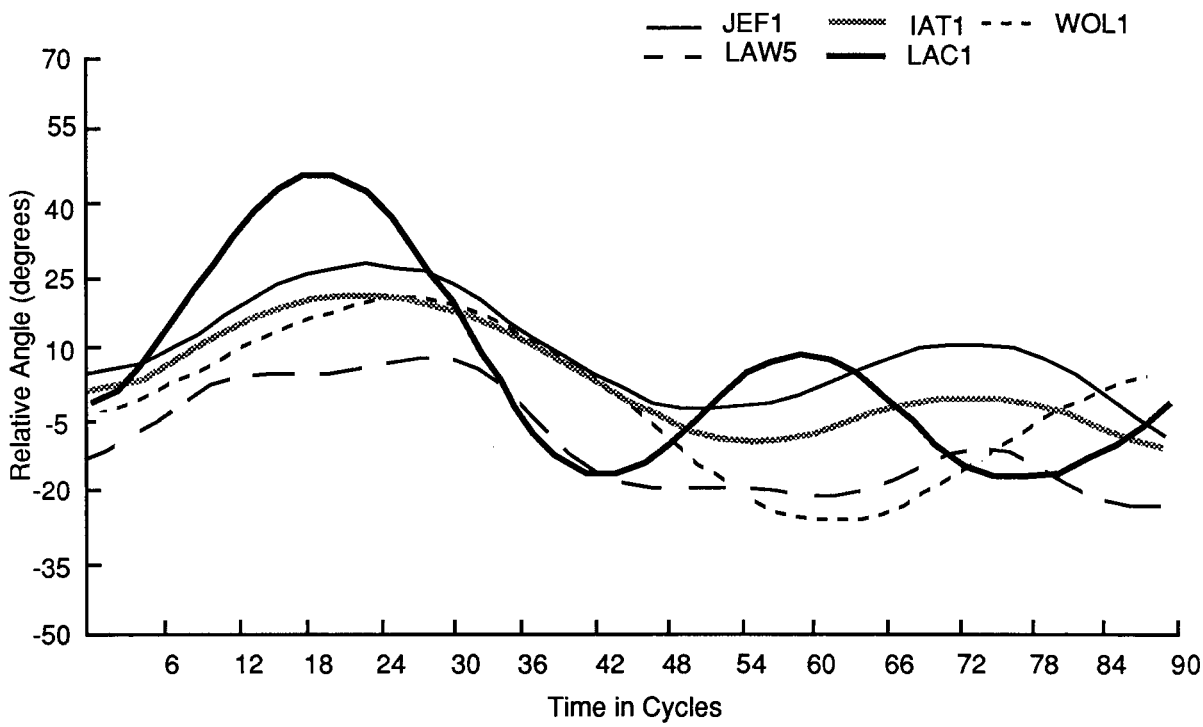


FIGURE 8.7—THREE-PHASE FAULT AT LACYGNE, REMOVING LACYGNE-WOLF CREEK FIRST.

TABLE 8.6--KPL PROJECTED DEMAND AND ENERGY GROWTH, BOTH WITH AND WITHOUT PROJECT.

Year	Without SSC		With SSC	
	GWH	MW	GWH	MW
1987	8066	1893	8066	1893
1988	8213	1927	8213	1927
1989	8382	1994	8382	1994
1990	8583	2004	8583	2004
1991	8782	2044	8782	2044
1992	8963	2077	8963	2077
1993	9091	2100	9091	2100
1994	9291	2131	9291	2131
1995	9522	2169	9522	2169
1996	9755	2197	10421	2297
1997	9973	2221	10639	2321
1998	10071	2228	10737	2328
1999	10191	2246	10857	2346
2000	10419	2286	11085	2386
2001	10731	2340	11397	2440
2002	11018	2391	11684	2491
2003	11306	2443	11972	2543
2004	11607	2497	12273	2597
2005	11835	2530	12501	2630
2006	11887	2539	12553	2639
2007	12010	2562	12676	2662
2008	12287	2609	12953	2709
2009	12613	2665	13279	2765
2010	12958	2725	13624	2825
2011	13316	2783	13982	2883

The load shown for the SSC represents operation beginning in 1996 and power requirements for only Substation 1. (6000 hours) (90 MW) + (2800) (45 MW) = 666,000 MWH.

represents only a 4.6 percent increase in demand for KPL and a 1.4 percent increase for KCPL, based upon projected 1996 forecasts. Both utilities have an annual system-load factor of about 50 percent, so each has ample capacity to meet the SSC's energy requirements year-round.

KPL and KCPL expect that future changes in the cost of providing electric service generally will track inflation, even though the cost of electric energy in both systems has decreased in recent years. The fuel-cost-adjustment clause in the proposed rate schedules provides the SSC with immediate benefits of fuel savings. The retail fuel-cost-adjustment billing factor has recently averaged about $0.00100 per Kwh for KPL. As indicated in the KCPL proposed rate schedule, the base for the fuel-cost-adjustment factor would be set to yield a net zero adjustment for 1987.

TABLE 8.7--KCPL PROJECTED DEMAND AND ENERGY GROWTH, BOTH WITH AND WITHOUT PROJECT.

Year	Without SSC		With SSC	
	GWH	MW	GWH	MW
1986	9,969	2,373	9,969	2,373
1987	10,298	2,452	10,298	2,452
1988	10,428	2,483	10,428	2,483
1989	10,685	2,528	10,685	2,528
1990	10,971	2,573	10,971	2,573
1991	11,251	2,614	11,251	2,614
1992	11,534	2,654	11,534	2,654
1993	11,871	2,740	11,871	2,740
1994	12,233	2,816	12,233	2,816
1995	12,564	2,874	12,564	2,874
1996	12,871	2,924	13,093	2,964
1997	13,187	2,967	13,409	3,007
1998	13,514	3,013	13,736	3,053
1999	13,851	3,057	14,073	3,097
2000	14,201	3,104	14,423	3,144
2001	14,556	3,154	14,778	3,194
2002	14,919	3,209	15,141	3,249
2003	15,292	3,266	15,514	3,306
2004	15,675	3,335	15,897	3,375
2005	16,067	3,415	16,289	3,455

The load shown for the SSC represents operation beginning in 1996 and power requirements for only Substation 2. (6,000 hours) (30 MW) + (2,800 hours) (15 MW) = 222,000 MWH.

8.2 INDUSTRIAL COOLING WATER

8.2.1 Itemization of the Available Sources of Water

Numerous sources of water exist in the collider area. Two sources have sufficient capacity to act as the sole supply to the SSC. Alternatively, a combination of sources may be used to supply various areas independently along the collider ring.

Because Kansas has implemented the most advanced water-resource-management program in the nation, the State can offer the SSC access to a municipal water supply with sufficient capacity to meet both its potable and industrial cooling water needs, thus reducing or eliminating the need for additional on-site treatment.

1. The City of Topeka can extend its water-distribution system south along U.S. Highway 75 to the proposed campus area. The extension covers about 15 miles and would require two pump stations. A flow rate of 2,200 gallons per minute (gpm) can easily be made with this proposed system. Topeka receives its water supply from the Kansas River and is participating in a unique water-supply-assurance district which manages the flow of the river with the support of over 400,000 acre-feet of storage in upstream Federal reservoirs. Water consumption in Topeka averages 22 million gallons per day (mgd), with maximum daily rates in the summer ranging from 40 to 47 mgd. The city possesses water rights totaling 129.5 mgd. The water-supply management and assurance program for the Kansas River has made it a reliable source for future growth, even through severe drought conditions. Therefore, supplying the collider demand of 3 mgd becomes a function of developing the distribution system to the south. The supply from Topeka would be available on a continuous 24-hour basis. The water supply would be backed up by a ground storage tank to continue service in the event of failure in the distribution system. The distribution system will be built to supply not only the collider demands but allow expansion of water service to peripheral industries that will likely develop along the U.S. Highway 75 corridor. The State of Kansas has negotiated implementing agreements with the City of Topeka (appendix 4, volume 8) and is committed to spending the estimated $7 million necessary for the construction of the delivery system to provide the SSC with the required amounts of high-quality water from the Kansas River. Development and financing of the distribution system will be a joint State-local responsibility.
2. Pomona Lake is a U.S. Army Corps of Engineers reservoir encircled by the collider ring. The reservoir currently has 66,600 acre-feet of storage in its multipurpose conservation pool. Pomona is primarily used for water-quality releases to the Marais des Cygnes River downstream. However, Pomona is undergoing analysis by the State and the U.S. Army Corps of Engineers for reallocation to water-supply purposes. Yield and reallocation studies indicate that 5.33 mgd may be obtained from Pomona during severe drought, even with a reduction in storage because of sediment accumulation. Thus, Pomona will reliably supply the 3 mgd demands of the SSC. Such use of Pomona still allows additional use of water supply and continued maintenance of downstream water-quality flows. Pomona could be used in combination with other water sources to satisfy a portion of the demands along the collider ring. For example, the southern section of the collider ring, including the experimental area, can probably best be served by the existing Vassar Water Treatment Plant located on the southern edge of the lake. If the entire collider water supply were to come from Pomona, a pipeline and booster pump would have to be constructed to deliver the raw water to the campus area. Construction of the delivery system would be a State responsibility.
3. The remote service areas around the collider ring could probably be served best by the numerous rural water districts in the collider area. The distribution systems of these districts cover nearly the entire ring area, with the exception of the southeast quadrant, which could be served by Pomona. Since the demands at the service areas are relatively low (50 gpm), rural water districts could accommodate those demands with an upgrade of facilities. The State of Kansas will assume costs associated with the delivery of water to the outlying service facilities. Table 8.8 lists the major rural water districts in the collider area, their source of supply, and their estimated current use. Since these districts are supplied by reservoirs or municipal water systems, they are reliable water sources for the service areas, even during drought conditions. Little variation in water-supply service would be expected, regardless of season.
4. Clinton Lake is a federal multipurpose reservoir with water-supply storage. The State has purchased the storage and sells the yield to municipalities and rural water districts. The State has marketed 13.6 mgd of the 18.8 mgd available from Clinton. Douglas County Rural Water District No. 5 receives water from the Lawrence Treatment Plant at Clinton and distributes it to southwest Douglas County. Osage County Rural Water District No. 5 receives water from the Tri-District Water Treatment Plant and distributes water in northeast Osage County. With an expansion of the Tri-District plant and upgrade of the

TABLE 8.8--MAJOR RURAL WATER DISTRICTS IN THE COLLIDER AREA.

County	District	Water-supply Source	Annual Water Use
Douglas	5	Clinton Lake through City of Lawrence	36 million gallons
Osage	3	Pomona Lake	27 million gallons
Osage	5	City of Carbondale and Clinton Lake	83 million gallons
Osage	7	City of Osage City	52 million gallons

system, a portion of the collider water demand can be met in the proposed campus area. As with Pomona, water supply from Clinton will not seasonally vary, even in the event of severe drought.

5. In some instances, fresh ground water may be available from the Tonganoxie and Ireland sandstones along the east border of the collider ring. These formations have saltwater deposits in the western collider area, rendering them unusable for water supply. However, in the east, some freshwater exists in the bedrock. The town of Overbrook receives its water from these formations. The major limiting factor is the yield of these formations. General-availability data indicate yields in the 10 to 100 gpm range and the maximum pumpage rate used by Overbrook is 52 gpm, necessitating the use of multiple wells to satisfy demands. Drilling wells may be an option for serving the eastern service areas, but it may be easier and less costly to serve those areas through public water-supply distribution systems. A specific recommendation on water supply is deferred to the detailed design stage of the project, but the inventory of the regional industrial water supply indicates adequate supplies available to meet the collider cooling demands. These supplies may be viewed as firm through drought and will not vary on a seasonal basis. A likely scenario would rely on one of the major sources, Topeka or Pomona, to supply most of the demand with service to certain remote areas through the rural water district distribution systems.

8.2.2 Estimated Cost of Industrial Cooling Water ($ per Million Gallons)

Overall cost of industrial cooling water will depend on the source of that water and if the water is distributed from the campus to all areas along the collider ring or if the water is delivered to remote areas from independent supply sources. Various mechanisms exist to sell the water to the collider project. Cost estimates for cooling water assume that 2,200 gpm will be used by the collider, most of which will be in the campus/injector area. Assuming continuous 24-hour activity, about 3 to 3.2 million gallons would be required each day for industrial cooling, totaling approximately 1,100 million gallons annually. Each service area would require about 50 gpm, approximately 26 million gallons annually if they were using water continuously. If the City of Topeka supplied the total demand of the collider, a contractual arrangement would be used. The cost of expanding the distribution system to serve the SSC would be borne by the State. Although specific cost provisions would depend on the terms of the contract, current contractual arrangements provide an estimate of the costs. Allowing for a 15-percent rate increase, the cost of obtaining 1,100 million gallons of treated water from Topeka would be $1.1 million at a unit rate of $969 per million gallons. Lower flat rates might be obtained from Topeka with contract provisions for guaranteed use of the water supply. If raw water were obtained from Pomona Lake, a contractual arrangement would be made with the U.S. Army Corps of Engineers through State programs for obtaining the water. The cost of water is a function of the capital cost of the storage needed to supply the water and the annual operation and maintenance costs associated with that storage. Approximately 9,400 acre-feet of storage are needed to provide 3 mgd from Pomona. The most recent unit cost of Pomona storage is about $82.50 per acre-foot, resulting in a capital cost of $1.6 million. This cost could be amortized over the life of the collider project (30 years). At 8 percent interest, the capital cost would require annual payments of $142,000. If annual operation costs of the storage are similiar to those for other reservoirs with water supply, an estimate of $75,000 annually is reasonable. Thus the annual unit cost of raw water under this approach would be $197 per million gallons. As an alternative, the State may market the water to the SSC and pool the costs with those charged to other state storage and water users. At a projected price of $0.12/1000 gallons ($120/million gallons), the industrial demand could be met from Pomona

under the State marketing program for $132,000. The cost of delivery of the raw water to the campus area would be borne by the State. Water obtained from a rural water district ranges in cost from $2.00 to $2.50 per 1,000 gallons ($2,000 to $2,500 per million gallons). This water is treated prior to delivery. Since the service areas could be served by rural water districts, the cooling demands at each area would cost approximately $52,000 to $65,000 annually.

8.2.3 Physical and Chemical Properties of the Water Available for Use as Industrial Cooling Water

Most sources of industrial cooling water would deliver treated water to the campus area or service areas. In the case of raw water from Pomona, routine treatment would be required. The water delivered from Topeka or the rural water districts is generally of potable quality. Relative to boiler-feed quality, Table 8.9 lists the important water-quality characteristics of water sources.

8.3 POTABLE WATER

8.3.1 Sources of Water Available for Use as Potable Water

The sources of potable water are the same as for industrial cooling water. All the sources can reliably supply the 250-gpm potable demand of the collider in addition to supplying the industrial demands. Topeka is anticipating use of its proposed distribution system to supply both industrial and potable water needs, as well as allowing expansion to accomodate peripheral industrial growth in the collider area. The Topeka water supply is already treated for potable use, eliminating the need to

TABLE 8.9--REPRESENTATIVE CHARACTERISTICS OF WATER SUPPLIES FOR COLLIDER.

Characteristic	Water Supply Source Pomona(raw)	Pomona(treated)	Topeka	Rural Water District
pH	7.9	7.5	9.0	8.5
Total Dissolved.Solids (mg/L)	240	219	362	179
Total Alkalinity (mg/L $CaCO^3$)	130	114	93	70
Total Hardness (mg/L $CaCO^3$)	163	164	127	122
Calcium (mg/L)	50	50	26	39
Magnesium (mg/L)	9	9	15	6
Sodium (mg/L)	11	12	74	14
Bicarbonate (mg/L)	116	139	103	82
Chloride (mg/L)	8	14	66	16
Sulfate (mg/L)	43	60	105	53

The treated Pomona sample came from the Vassar Water Treatment Plant on the south side of the lake, which could supply the south collider ring area including the experimental area. The sample from the rural water district is taken from the Tri-District Treatment Plant near Clinton Lake. The samples indicate generally good quality water which is economically feasible to treat to the desired levels of hardness and alkalinity using conventional methods. Additional treatment will be necessary to remove the dissolved solids from the treated water for use as low-conductivity water.

develop water-treatment facilities for campus use. Pomona Lake can also accommodate the potable demand through severe drought. If Pomona were to serve the campus area, treatment of the raw water would be necessary to allow potable use. If Pomona were to serve only the southern experimental area, the Vassar Treatment Plant could be used to provide potable water. Various rural water districts in the collider area are public water-supply systems and should supply the modest potable demands at the service areas easily. Ground water along the eastern side of the collider ring may serve some potable needs at service areas in the Overbrook and Michigan Valley areas. Ground water in these areas is of good quality, but yields from the Tonganoxie and Ireland sandstones may be limited. The source of potable water for the collider area will largely be determined by the method of supplying larger industrial cooling-water demands.

8.3.2 Estimates of the Present and Projected Cost of Potable Water

The cost of water supplied by the various sources does not vary relative to the type of use. Thus, the unit costs estimated for industrial cooling water also apply to potable water. The total annual cost will be smaller since the amount of water used for potable needs is a fraction of that needed for cooling purposes. Assuming the average demand of 250 gpm occurs over 12 hours daily, an annual potable demand of approximately 66 million gallons would be necessary. Topeka would utilize a contractual arrangement similiar to that used for supplying surrounding rural water districts. The current price policy charges a flat $0.63 per 100 cubic feet under such contracts. This price translates to a unit cost of $843 per million gallons. However, Topeka is undergoing a review of its rate structure and increased rates will be expected for the future. A rate increase of 15 percent can be expected, driving the unit price of water to $969 per million gallons and bringing the annual cost of potable supplies to $64,000. Water from Pomona could be obtained through an independent contractual arrangement with the State or through the State's marketing program. As was demonstrated for industrial cooling water, the SSC would likely benefit from utilizing the economy of scale available through the marketing program. Thus, the current price of marketing water is $120 per million gallons of raw water and potable supplies would cost $8,000 annually. The price of water under the marketing program will be a function of the unused water supply in the State system, the number of users, and the annual operation and maintenance costs for water-supply storage. To date, the maximum unit cost of marketing water has been about $165 per million gallons. This price would raise annual costs of potable water supply to about $11,000. Rural water districts could supply the potable-water demands at the service areas around the collider ring. Costs for treated water are approximately $2,000 to $2,500 per million gallons. Since the potable demands at the service areas are likely to be small, their associated annual costs will not be high relative to those at the campus and experimental areas.

8.4 FUEL

8.4.1 How Fuel Heating/Cooling Requirements Will Be Met

A reliable supply of natural gas is available through the Kansas Power and Light Company (KPL) to meet the heating, cooling, and other needs of the SSC site. KPL currently provides natural gas service to nearly 1 million customers in Kansas, Missouri, Oklahoma, and Nebraska, and electricity to nearly 300,000 customers in Kansas. The company's annual natural-gas delivery is in excess of 200 million MCF (million cubic feet). The gas to serve the SSC site will come from one of KPL's major suppliers, Williams Natural Gas Co. (WNG), at a site in southern Osage County.

KPL's system already meets or exceeds all SSC specifications for fuel supply. The maximum heating-degree-day month on record in the area of the SSC site is 1,643. Therefore, the fuel-delivery system proposed for the site is designed to provide 100 million BTU/hour, instead of the 55 million BTU/hour specified in the ISP for a 900 heating-degree day month (as specified in DOE's Invitation for Site Proposals for the SSC, April 1987).

Despite tremendous changes within the natural gas industry over the past several years, KPL's fuel-supply reliability record remains outstanding, with no interruption of supply to large users because of a lack of volume for the past six years. WNG's reserve-life index continues to be strengthened as new contracts are secured replacing expiring contracts. WNG maintains 740 PSIG (pounds per square inch gauge) during peak conditions on the 26-inch gas-transmission line that will be tapped to serve the SSC complex. This tap will be made near the south side of the SSC ring (Figure 8.8). An 8-inch pipeline will be installed to run adjacent to U.S. Highway 75 to the north-campus complex. The south complex will also be served from this tap.

At the junction of U.S. Highways 75 and 56, the north-south pipeline will be tied into an existing KPL pipeline now serving the communities of Scranton and Overbrook, thereby providing redundancy to both the north and south SSC facilities. Under this scenario, KPL's service responsibility would end at the master-meter

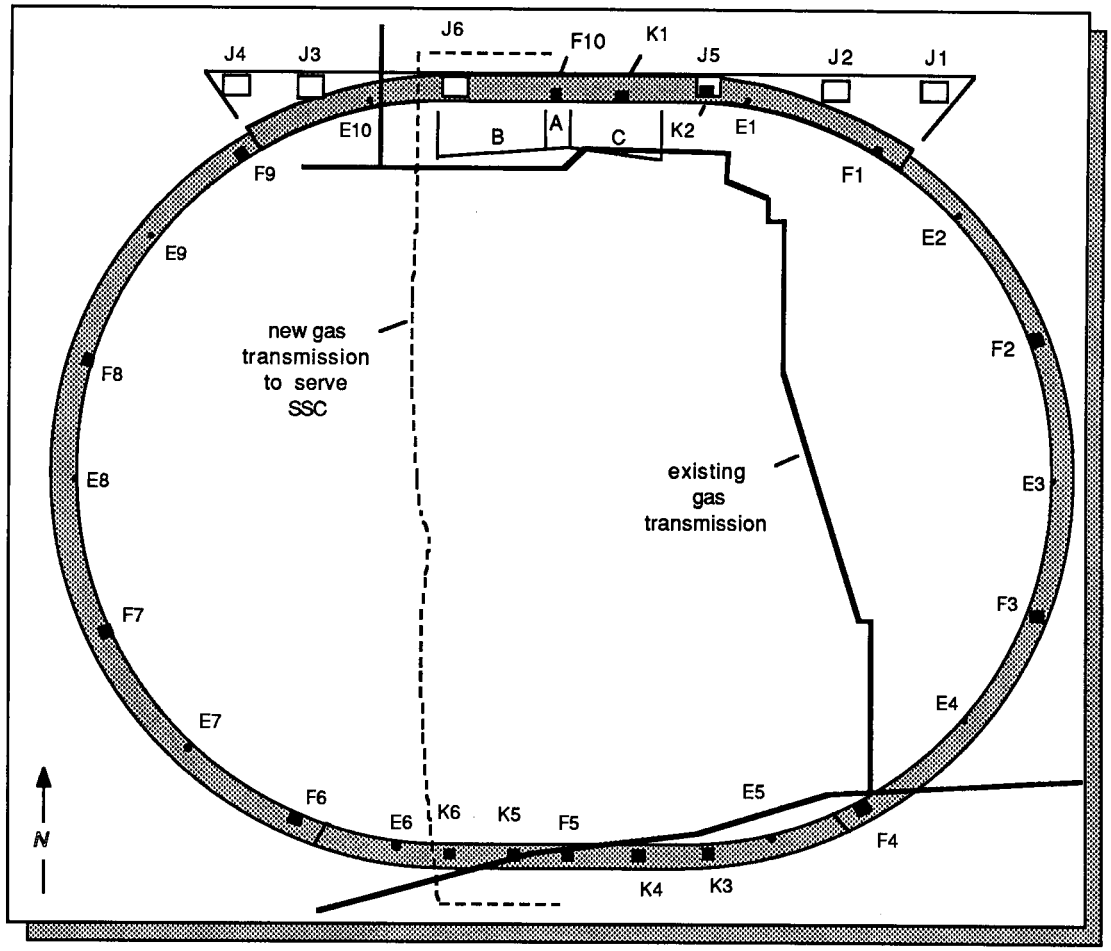


FIGURE 8.8—EXISTING AND PROPOSED GAS TRANSMISSION LINES.

location at the north and south SSC facilities.

The State of Kansas proposes two alternatives to this plan. One calls for KPL to install, own, and maintain the natural gas distribution system on the SSC campus. The other calls for the SSC's heating and cooling needs to be met with all-electric equipment. The first alternative would decrease the initial and ongoing operation and maintenance costs of the SSC project. However, the State of Kansas recommends the second alternative because electricity is the most economical energy source for the SSC's fuel requirements when considering heat-pump technology, the large additional cost of facilities to provide gas, and the low incremental electrical-energy cost for meeting additional off-peak kwh sales (no additional demand charge) as discussed in Section 8.1.4.

As a major utility, KPL will work with DOE to achieve the most effective and cost-efficient methods of energy conservation within the SSC facility.

8.4.2 Cost of Fuel Supply in $/MBTU

The attached filed rate-schedule (appendix 5, volume 8) represents the current cost for a customer such as the SSC. The rate schedule refers to a Purchased Gas Cost Adjustment Schedule. The Purchased Gas Cost Adjustment factor for June 1987 was $0.5114 per mcf. Under this concept for service, additional charges of $18,124/month will be necessary to compensate KPL for the facilities installed.

Under the first alternative where KPL installs, owns, and maintains the campus-distribution system, KPL estimates an additional charge of $24,345/month will be required. Under the second alternative, where all heating needs are met by only electricity, the cost per million BTU of usable heat is reduced from the $9/MMBTU range to the $3/MMBTU range (see appendix 2, volume 8).

8.5 WASTE AND SEWAGE DISPOSAL

8.5.1 Available Treatment Facilities

Eight communities with populations ranging from approximately 300 to 2,000 are located in the vicinity of the proposed collider ring. Carbondale, 2.5 miles to the northwest, is closest to the campus. This community, population 1,518, utilizes a lagoon for treatment of its sewage. The system is operating at or near capacity and could not handle the quantity of sewage produced at the various facilities on the SSC campus. Connecting to this system would require expansion of their lagoon or construction of a new, more sophisticated treatment facility, construction of a lift station, and the addition of approximately 4 miles of sewer line. Therefore, the DOE conceptual design of an on-site sewage-treatment plant is appropriate. This system (an advanced waste-treatment plant) will produce effluent which meets or exceeds State standards for discharge into stream channels, should that become necessary. The effluent could also be retained onsite for landscape irrigation.

The remaining SSC facilities are dispersed around the collider ring. Due to the low volume of sewage generated at these points, the length of lines required (1 to 3 miles), and the likely need for lift stations, it is not feasible to tie these facilities into treatment plants of surrounding communities. Treatment at these points will be handled by DOE through the use of appropriate individual systems that meet all applicable State standards.

Blowdown from the cooling towers located around the ring will be stored in ponds lined with an impermeable membrane. It is proposed in Section 3.5.4 that these lined ponds be constructed near the location of each of the refrigeration (F) shafts in the earliest phase of construction and that the ponds be used to collect any water produced during the shaft-sinking or tunneling operations. At the same time, two underground-injection or deep-disposal wells are proposed to be constructed near the north and south clusters to accept any of this water from underground construction that does not meet environmental standards. The water will be pumped from the ponds periodically and hauled by tank truck to the nearest disposal well. During operation of the facility, blowdown water from cooling towers, as discussed above, water-treatment effluents, and other similar liquids can be handled in a like manner. The ponds are not intended to be evaporation lagoons.

8.5.2 Solid Waste

Waste sites with sufficient capacity to accept conventional solid waste generated by the SSC exist within the area. Existing fill locations that are accessible by commercial trash contractors are in operation in Osage, Shawnee, and Douglas counties (see Figure 8.9).

Over 1.3 million cubic yards of additional capacity can be made available at DOE option in the seven sites identified for tunnel-spoils disposal (Section 3.5.5 and Table 3.12). The State of Kansas is prepared to convey fee simple title to these sites or purchase sufficient easements for spoils and solid-waste disposal.

Under either arrangement, DOE can rely upon sufficient solid-waste-disposal capacity within the immediate area of the ring to accommodate all conventional solid waste projected to occur over the life of the facility.

No hazardous-waste landfills are now licensed to operated in Kansas. Under Kansas law, land burial of hazardous wastes is prohibited, and State policy favors treatment on the generator's site or by specialized contractors. Two specialized waste-treatment contractors currently operate within Kansas and are utilized by in-state generators. These firms and selected facilities in other states which are currently utilized by Kansas waste generators are listed in Table 8.10.

It should be noted that 1986 amendments to the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) require states wishing to utilize federal "superfund" resources to identify by 1989 sufficient capacity to dispose of hazardous wastes projected to be generated within their borders over a 20-year period (42 USC 9604 (c) (9)). At least one facility in Kansas with sufficient capacity to dispose of SSC wastes is under consideration for licensure.

Given the relatively small amounts of hazardous waste projected to be generated by the SSC during construction and operation, disposal should present no problems.

Insofar as SSC waste will be considered as "DOE generated" waste under the provisions of the Low Level Waste Policy Act Amendments of 1985 (42 USC 2021c (a) (1) (B) (i)), Kansas assumes that the DOE will undertake and maintain responsibility for disposal at existing DOE sites of the estimated 8,100 cubic feet of low-level radioactive waste and tritiated water projected to be generated by the SSC.

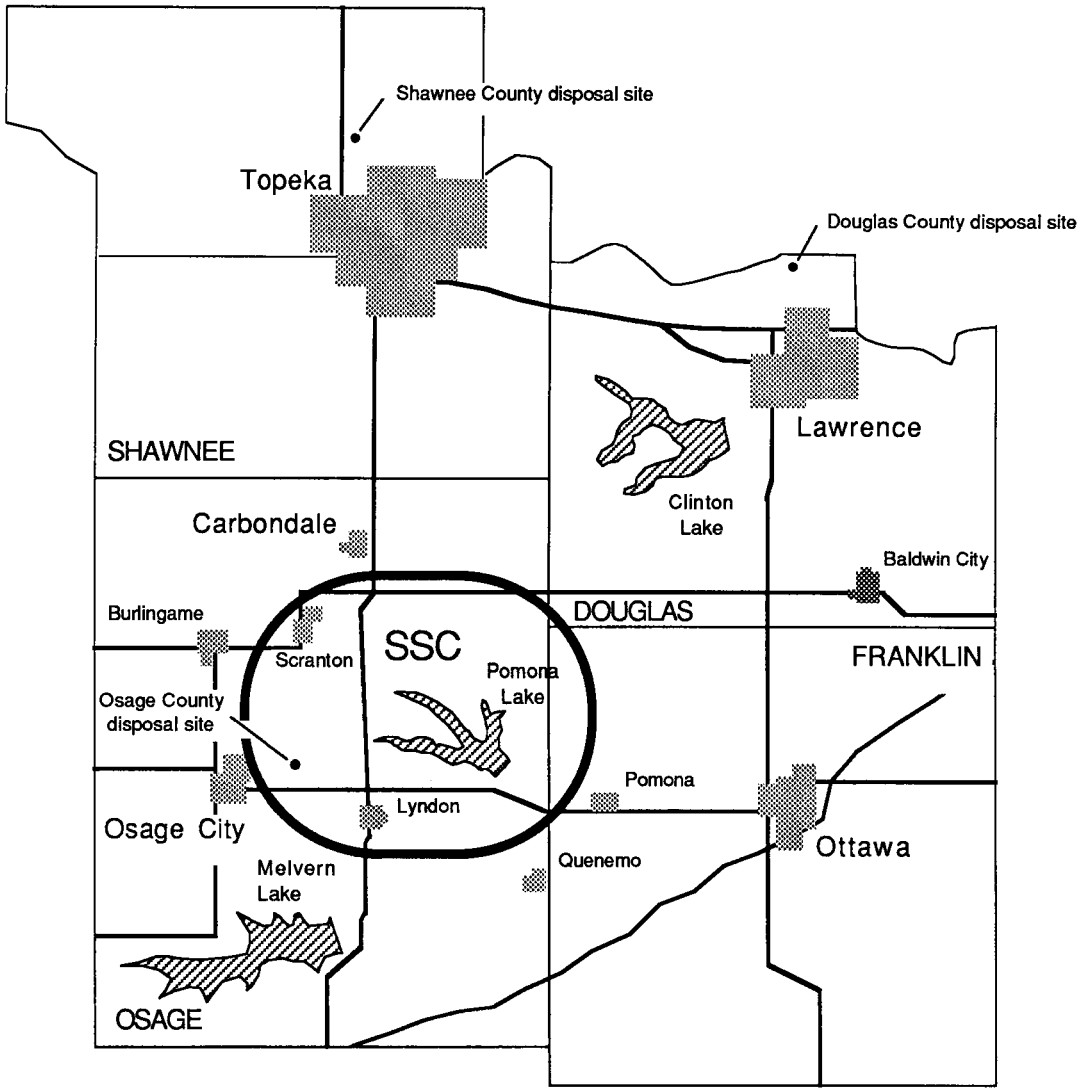


FIGURE 8.9—EXISTING SANITARY LANDFILLS IN OSAGE, SHAWNEE, AND DOUGLAS COUNTIES.

TABLE 8.10—SELECTED HAZARDOUS-WASTE MANAGEMENT FACILITIES REGULARLY UTILIZED BY KANSAS HAZARDOUS-WASTE GENERATORS.

FACILITY AND ADDRESS	SERVICES	WASTE HANDLED
Systech Corporation P.O. Box 29 Cement Plant Road Fredonia, KS 66736 (316) 378-4451 EPA I.D. No. KSD980633259	Incineration	Organic solvents
Safety-Kleen Corp. 1311 S. Anna Wichita, KS 67209 EPA I.D. No. KSD000809723	Solvent recycling	Degreasers and selected solvents
600 E. Trail Dodge City, KS 67801 EPA I.D. No. KSD980686844	Solvent recycling	Degreasers and selected solvents
9317 Woodend Road Edwardsville, KS 66022 EPA I.D. No. 980973515	Solvent recycling	Degreasers and selected solvents
United States Pollution Control, Inc. P.O. Box 9674 Tulsa, OK 74157 (918) 446-2786 EPA I.D. No. OKT410010474	Landfill, treatment	All types of wastes
ILWD, Inc. 1005 East 5th Kansas City, MO 64106 (816) 842-1378 EPA I.D. No. IND093219012	Treatment	Liquids and sludges
Envirosafe Services, Inc. of Idaho P.O. Box 936 Moutain Home, ID 83647 (303) 693-3247 EPA I.D. No. IDD073114654	Landfill, treatment	All types of wastes
GSX Services, Inc. Corporate Headquarters P.O. Box C Old Green Pike Greenbriar, TN 37073 (615) 643-4511 EPA I.D. No. TND000645770	Landfill, treatment	All types of wastes

Volume 8

Appendix 1—Kansas Corporation Commission contingent approval of utility-rate structures

State of Kansas

MIKE HAYDEN GOVERNOR
KEITH R. HENLEY CHAIRMAN
RICH KOWALEWSKI COMMISSIONER
MARGALEE WRIGHT COMMISSIONER
JUDITH McCONNEL EXECUTIVE DIRECTOR

Kansas Corporation Commission

Fourth Floor, Docking State Office Bldg.
Ph. 913-296-3355
TOPEKA, KANSAS 66612-1571

July 30, 1987

Dear Sir:

We are enclosing a copy of order in Docket Nos. 156,642-U and 156,646-U, as entered by the Commission on the 30th day of July 1987.

Yours very truly,

STATE CORPORATION COMMISSION

Judith McConnell

Judith McConnell, Exec. Director

dd
enc.

BEFORE THE STATE CORPORATION COMMISSION

OF THE STATE OF KANSAS

Before Commissioners: Keith R. Henley, Chairman
Rich Kowalewski
Margalee Wright

In the Matter of the Application of The Kansas Power and Light Company for Commission Approval of its Bulk Power Contract Service Rate Schedule.	))))	Docket No. 156,642-U
In the Matter of the Application of Kansas City Power and Light Company for Commission Approval of its Service Schedule SSC and Associated Energy Cost Adjustment Schedule ECA-SSC.	)))))	Docket No. 156,646-U

ORDER

The above captioned matters come before the State Corporation Commission of the State of Kansas on Applications filed by Kansas Power and Light Company and Kansas City Power and Light Company requesting approval of their tariffs designed to provide service to the super conducting super collider, in the event that Kansas should be chosen as the site for that facility. Having reviewed the applications and the tariffs filed therewith, being familiar with its files and records and duly advised in the premises the Commission finds and concludes as follows:

1. On June 10, 1987, the Commission issued an order in Docket No. 156,009-U in which it approved a stipulation agreed to by all parties to that proceeding. In that order the Commission found that the stipulation provided a satisfactory resolution of the disputed issues in the docket. That order designated Kansas Power and Light Company as the lead utility for service to the north substation of the proposed SSC site. The order designated Kansas City Power and Light Company as the lead utility for the south substation of the proposed site.

2. The Invitation for Site Proposals (ISP) for the SSC, issued by the Department of Energy requires that states seeking to have the SSC located within their boundaries shall in their

applications provide utility rate schedules which include energy and demand charges for an industrial load as represented by the SSC. In their applications both KPL and KCPL represent that they currently serve no industrial customers in Kansas which are of the nature of the SSC and that they therefore do not have an applicable rate schedule on file with the Commission which would be appropriate for an industrial customer with service characteristics and a load pattern such as the SSC. The companies have therefore submitted their applications and tariffs seeking approval of those tariffs by the Commission on a contingent basis. The Applicants represent that the tariffs should be approved to become effective only on the condition that the Kansas site be chosen for the SSC. The tariff filed by Kansas Power and Light Company indicates that it is applicable "to any customer who executes a special contract for electric service supplied at one point of delivery whose total energy and power requirements for the point of delivery are supplied by the company and who agrees to a contract capacity of 80,000 KVA or more for a contract term of 10 years or more". The tariff further indicates that the character of the service will be alternating current, 60 hertz, 3 phase, at the voltage specified in the Special Contract. Kansas Power and Light's tariff sets out a rate which includes a capacity charge of $6.90 per KVA of billing capacity and an energy charge of 2.2¢ per kilowatt hour for all kilowatt hours. KPL's tariff also provides for a special facility charge on a monthly basis of 1 and 3/4 percent of the installed cost of any special facilities installed and owned by the company which are required to serve specific requirements of the customer. The tariff further specifies that the rates are subject to adjustments such as the energy cost adjustment clause, tax adjustment and research and development surcharge. It further specifies that the billing capacity at the point of delivery for each summer month shall be

the highest capacity established during the current month, provided the billing capacities for July, August, and September shall not be less than the highest capacity previously established in the current summer period; and the billing capacities for other months shall be the highest capacity established in the preceding summer period. The summer period is June 15 - September 15, inclusive. The tariff also specifies that in no event shall the billing capacity be less than the contract capacity as stated in the Special Contract. The tariff also provides for a minimum which is the capacity charge, plus the special facilities charge and applicable adjustments and surcharges. It also provides for the highest capacity at the point of delivery to be the average Kw load during the 30 minute period of maximum use during the month divided by power factor measured for the same 30 minute period. Any leading kilovolt-amperes supplied during the period will not to considered. The tariff also provides for adjustments to the contract capacity. Furthermore the tariff sets out the point of delivery and metering, termination of the contract, and changes in the rates or terms of the contract as well as other terms and conditions.

3. Kansas City Power and Light Company's tariff provides for three phase alternating current service at the available transmission voltage of not less than 161,000 volts to loads of 30,000 kilovolt-amperes or more. It is applicable only where the company is the sole source of supply to the facility served from the delivery point. The tariff further provides that contracts under the schedule shall be for a minimum term of 10 years, and for contract termination. The rate specified in Kansas City Power and Light Company's tariff includes a demand charge of $85.80 per kilovolt-ampere per year payable at the rate of $7.15 per kilovolt-ampere per month for each kilovolt-ampere of reserved capacity. The tariff provides for an energy charge as follows: A base energy charge shall be 2.29¢ per kilowatt hour for each kilowatt hour delivered during the billing

period. The tariff further provides for an energy cost adjustment charge which shall be equal to the energy cost adjustment factor for the billing period multiplied by the kilowatt hours delivered in the billing period. The energy cost adjustment factor is a charge (or credit) per kilowatt hour determined according to the methodology set out in the schedule ECA-SSC. The tariff further provides for an additional facility charge for each month equal to 1 3/4¢ per month of the companies gross investment in additional facilities. The minimum charge provided for in the tariff is the demand charge plus the additional facilities charge. A tax adjustment, schedule-TA, shall be applicable to all customer billings under the schedule. The tariff provides that the billing period shall generally correspond to the calendar month. Demand charges and additional facilities charges will be prorated for billing periods of less than 27 days or more than 33 days. The summer season includes 4 consecutive months. Demand will be determined by demand instruments or, by demand tests, and shall be the highest kilovolt-ampere demand indicated in any 30 minute interval during a specific month. The tariff also defines reserved "demand" and addresses the point of delivery, metering and rate changes. An energy cost adjustment schedule is attached to the tariff, it includes the formula for computing the energy cost adjustment for the SSC.

4. Commission staff has reviewed the tariffs filed by KPL and KCPL which would apply to the SSC if it were to be located in Kansas. Staff has recommended to the Commission that the tariffs filed are reasonable and has recommended that the Commission approve said tariffs. The Commission finds on the basis of staffs recommendations and its own examination of these matters that the tariffs proposed by KPL and KCPL for the SSC are reasonable and shall be approved. The Commission agrees that the effective date of the tariffs shall be contingent upon the location of the SSC in Kansas.

IT IS, THEREFORE, BY THE COMMISSION ORDERED that the tariffs filed by KPL and KCPL for service to the SSC shall be approved but be made effective only on condition that the SSC is located in Kansas.

The Commission retains jurisdiction over the parties and the subject matter for the purpose of issuing such further order or orders as it may deem necessary.

Dated: July 30, 1987

Henley, Chm.; Kowalewski, Com.; Wright, Com.

ORDER MAILED
JUL 30 1987
Executive Director

Judith McConnell
Executive Secretary

EP:vib

Volume 8

Appendix 2—Kansas Power and Light rate schedule, covering Substation I

THE KANSAS POWER AND LIGHT COMPANY

BULK POWER CONTRACT SERVICE

AVAILABLE

Electric service is available under this schedule at points on the Company's existing high voltage transmission facilities.

APPLICABLE

To any Customer who executes a Special Contract for electric service supplied at one point of delivery, whose total energy and power requirements for the point of delivery are supplied by the Company, and who agrees to a Contract Capacity of 80,000 KVA or more for a Contract Term of 10 years or more. Temporary, breakdown, standby, supplementary or resale service will not be provided under this schedule.

CHARACTER OF SERVICE

Alternating current, 60 hertz, 3 phase, at the voltage specified in the Special Contract.

NET MONTHLY BILL

Rate

Capacity Charge

$ 6.90 Per KVA of Billing Capacity, plus

Energy Charge

2.20 ¢ Per KWH for all KWH, plus

Special Facilities Charge

For all special facilities installed and owned by the Company to serve the specific requirements of the Customer, there shall be a monthly charge of one and three fourths percent (1 3/4%) of the installed cost of such facilities.

Minimum

The Capacity Charge, plus the Special Facilities Charge and applicable adjustments and surcharges.

Adjustments and Surcharges

The rates hereunder are subject to adjustment as provided in the following schedules:

1. Energy Cost Adjustment Clause

2. Tax Adjustment - Electric

3. Research and Development Surcharge - Electric

SUMMER PERIOD

The summer period shall be the period of June 15 through September 15, inclusive.

BILLING CAPACITY

Billing Capacity at the point of delivery for each summer month shall be the Highest Capacity established during the current month, provided that the Billing Capacities for July, August, and September shall not be less than the Highest Capacity previously established in the current summer period; and, the Billing Capacities for other months shall be the Highest Capacity established in the preceding summer period.

In no event, shall the Billing Capacity be less than the Contract Capacity as stated in the Special Contract.

HIGHEST CAPACITY

Highest Capacity at the point of delivery shall be the average KW load during the thirty minute period of maximum use during the month divided by the power factor measured for the same thirty minute period. Any leading kilo-volt-amperes supplied during the period will not be considered.

ADJUSTMENTS TO CONTRACT CAPACITY

Company shall not be obligated to serve loads in excess of the Contract Capacity during the summer period; however, the Contract Capacity may be adjusted in accordance with the following provisions:

1. Should Customer's Billing Capacity for any summer period month exceed the Contract Capacity, the Contract Capacity will be immediately increased to equal that monthly Billing Capacity.

2. Customer may initiate a reduction in the Contract Capacity upon written notice given not less than six years prior to the effective date of the reduction. Such reductions will be limited to a maximum of 10% of the Contract Capacity in effect at the time of the reduction request. Reduction notices may be issued no more frequently than annually. These reduction provisions are non-cumulative and the Contract Capacity shall not be reduced below 60% of the Contract Capacity initially set forth in the Special Contract.

3. Customer may request an increase in the Contract Capacity at any time. Customer shall provide Company with written notice of the need for an increase in the Contract Capacity. The requested increase in Contract Capacity will be made if it is within the planning horizon of the utility or if the capacity is available. If such capacity is not available, Company will make a good faith effort to acquire it.

POINT OF DELIVERY AND METERING

The point of delivery shall be the termination of Company's high voltage transmission facilities. At Company's option, it may meter capacity and energy at the load side of Company or Customer owned transformers. If metering is installed at the load side of transformation facilities, appropriate adjustments will be made to such metered quantities.

CONTRACT TERMINATION

The Special Contract entered into for service under this schedule will contain an initial term of ten years from the date of commercial operation of the facility served. The Special Contract may be terminated thereafter by Customer upon written notice given ten years prior to the date of termination.

If the contract is terminated by Customer prior to its thirtieth anniversary date, Customer and Company shall negotiate the terms under which Customer shall reimburse Company for any unrecovered investment in special facilities built to serve Customer.

CHANGES IN RATES OR TERMS

Company shall retain the right to unilaterally make application to the State Corporation Commission of the State of Kansas or the regulatory authority having jurisdiction for a

change in rates or terms of service pursuant to the Rules of Practice and Procedure of such regulatory authority.

OTHER TERMS AND CONDITIONS

Service hereunder is subject to the Company's General Terms and Conditions for Electric Service as approved by the State Corporation Commission of the State of Kansas.

Volume 8

Appendix 3—Kansas City Power and Light rate schedule, covering Substation II

KANSAS CITY POWER & LIGHT COMPANY
SERVICE SCHEDULE SSC
(Reflects 1987 Cost Levels)
June 23, 1987

AVAILABILITY:

For three-phase alternating-current service at the available transmission voltage of not less than 161,000 volts to loads of 30,000 kilovolt-amperes or more.

APPLICABILITY:

Applicable only where the Company is the sole source of supply to the facilities served from the delivery point.

TERM:

Contracts under this schedule shall be for a minimum term of ten years. The Contract shall continue from year to year thereafter unless terminated by 120 months advanced written notice delivered during the first fifteen years or unless terminated by 60 months advanced written notice delivered after the twentieth year.

RATES:

Demand Charge:

Reserved Capacity Charge

The charge for Reserved Capacity shall be $85.80 per kilovolt-ampere per year payable at the rate of $7.15 per kilovolt-ampere per month for each kilovolt-ampere of Reserved Capacity.

Energy Charges:

Base Energy Charge

The Base Energy Charge shall be $0.0229 per kilowatt-hour for Each kilowatt-hour delivered in the Billing Period.

Energy Cost Adjustment Charge

The Energy Cost Adjustment Charge shall be equal to the Energy Cost Adjustment Factor for the Billing Period multiplied by the kilowatt-hours delivered in the Billing Period. The Energy Cost Adjustment Factor is a charge (or credit) per kilowatt-hour determined according to the methodology set out in Schedule ECA-SSC.

[Note: The Base Energy Charge above has been adjusted to reflect an average Energy Cost Adjustment Factor of zero for the year 1987.]

Additional Facilities Charges:

At the request of the Customer, the Company shall construct, own, operate, and maintain transformation facilities, subtransmission lines, and associated electrical and mechanical facilities necessary to redeliver power and energy from the Delivery Point under this Schedule to the Customer at various locations designated by the Customer within the Project Area. The Additional Facilities Charge for each month shall be equal to 1 3/4 percent per month of the Company's Gross Investment in Additional Facilities. The Customer shall provide, without cost to the Company, all necessary rights-of-way and easements required for Additional Facilities.

Minimum Charge:

The minimum monthly charge shall be the Demand Charge plus the Additional Facilities Charge.

Tax Adjustment:

Tax Adjustment Schedule TA shall be applicable to all customer billings under this schedule.

BILLING PERIOD:

The Billing Period shall generally correspond to the calendar month. Demand Charges and Additional Facilities Charges will be prorated for Billing Periods of less than twenty-seven days or more than thirty-three days.

WINTER SEASON:

Eight consecutive months, the first such month to begin with customer's first regular meter reading date which occurs on or after September 1 each year.

SUMMER SEASON:

Four consecutive months not included in the Winter Season.

DETERMINATION OF DEMAND:

Demand will be determined by demand instruments or, at the Company's option, by demand tests, and shall be the highest kilovolt-ampere demand indicated in any thirty-minute interval during that month.

RESERVED DEMAND:

The Reserved Demand shall be the contract kilovolt-ampere demand or other demand determined by this section. The initial contract demand shall not be less than 30,000 kilovolt-amperes. The Reserved Demand may be increased by the customer effective May 1 of any year subject to the determination by the Company that sufficient capacity exists to serve the customer's increased needs. Requests for increases in the Reserved Demand shall be made in writing at least six months prior to the requested date the increased Reserved Demand is to be made available. Once established, a Reserved Demand may only be decreased by five years prior written notice delivered to the Company prior to the May 1 effective date of the decrease. The Reserved Demand may only be decreased by ten percent of the then effective Reserved Demand in any one year, and the maximum aggregate reductions shall not reduce the Reserved Demand below sixty percent of the original contract demand. During the Winter Season the customer may exceed the Reserved Demand, and the excess of the customer's Demand in the current month over the Reserved Demand shall not be considered for billing purposes. Increases in Winter Season Demand shall be subject to a determination by the Company that sufficient generation and delivery facilities are available to meet the increased Winter Season Demand. During the Summer Season, the customer's failure to request increased Reserved Demand or the Company's failure to assent to increased Reserved Demand shall not relieve the customer of continuing payment for increased Reserved Demand taken by the customer and supplied by the Company.

POINT OF DELIVERY:

The Point of Delivery for power and energy delivered hereunder shall be the point at which the transmission conductors of the Company connect with the conductors of the customer or such point where power and energy is delivered to Additional Facilities provided hereunder by the Company.

METERING:

The metering point shall be at the transmission point of delivery or at the Company's option at a lower voltage point. If deliveries are metered at such lower voltage point, they shall be compensated to reflect deliveries at the transmission delivery point.

RATE CHANGES:

This schedule shall be subject to change in any general rate proceeding.

REGULATIONS:

Subject to the Rules and Regulations Applying to Electric Service filed with the State Regulatory Commission.

Volume 8

Appendix 4—Memorandum of understanding between the State of Kansas and the City of Topeka concerning the water supply for the SSC

MEMORANDUM OF UNDERSTANDING

BY AND BETWEEN

THE KANSAS WATER OFFICE
AND
THE TOPEKA, KANSAS, PUBLIC WORKS DEPARTMENT

Date 9 July 87

Joseph F. Harkins, Director
Kansas Water Office

Eddie Snethen, Director
Topeka Public Works Department

SUBJECT: WATER SUPPLY FOR THE PROPOSED SUPERCONDUCTING SUPER COLLIDER

This memorandum has been prepared to confirm points of general agreement which are the basis upon which the City of Topeka has been identified as an alternative source of water supply for the proposed Superconducting Super Collider (SSC) project. This memorandum is intended to provide the basic framework within which formal negotiations and agreements will be developed if and when Kansas is selected as the site of the SSC and the U.S. Department of Energy selects the Topeka water supply system as its preferred water supply source for the project.

The Kansas Water Office and the City of Topeka Public Works Department agree:

1. The City of Topeka has the treatment capacity to meet the requirements of the SSC project;
2. The City of Topeka has access to adequate raw water supplies to meet the requirements of the SSC project;

3. The City of Topeka Public Works Department can feasibly extend a main to the project site;
4. The City of Topeka can feasibly offer water to the project at a wholesale price;
5. The City of Topeka can feasibly serve other users, specifically, the City of Carbondale, with the proposed main;
6. The state would be obligated to pay for the cost of extending the main to the site; provided, that prorated costs associated with delivering water to customers other than the SSC project would be repaid to the state.

Volume 8

Appendix 5—Kansas Power and Light rate schedule, large-customer gas service

Form RF

Index No.

THE STATE CORPORATION COMMISSION OF KANSAS

SCHEDULE GLk

THE KANSAS POWER AND LIGHT COMPANY
(Name of Issuing Utility)

Replacing Schedule GLk-10/86 Sheet 1

Kansas - Rate Area "k"
(Territory to which schedule is applicable)

which was filed September 16, 1986

No supplement or separate understanding shall modify the tariff as shown hereon.

Sheet 1 of 2 Sheets

GENERAL GAS SERVICE - LARGE

AVAILABLE

At points on the Company's existing distribution facilities located in the communities specified in the Index.

APPLICABLE

To natural gas service supplied at one point of delivery to commercial customers whose maximum monthly requirement has exceeded 3,000 MCF during the most recent 12 month period. Upon the election of the customer and acceptance by the Company, this rate is also applicable to natural gas service supplied at one point of delivery to commercial and industrial customers whose maximum monthly requirement has not exceeded 3,000 MCF during the most recent 12 month period provided such customers maintain a load factor of 70% or greater. For purposes of this rate, load factor shall be determined by dividing the customer's average monthly consumption for the most recent 12 month period by the customer's maximum monthly consumption during the months of October through May for that same period.

NET MONTHLY BILL

Rate

$30.00 plus $3.0762 per MCF for all MCF delivered.

Minimum

The higher of the above rate for zero consumption plus applicable adjustments and surcharges, or the minimum as set forth by contract.

Adjustments and Surcharges

The rates hereunder are subject to adjustments as provided in the following schedules:

1. Purchased Gas Cost Adjustment Schedule.
2. Tax Adjustment Schedule.

Schedule 8.4-1

154608-

Commission File Number

Issued February (Month) 25 (Day) 1987 (Year)

Effective April (Month) 7 (Day) 1987 (Year)

By STEVEN L. KITCHEN (Signature of Officer) Vice President (Title)

FILED APR 2 1987

THE STATE CORPORATION COMMISSION OF KANSAS

By Secretary

MI-701

Form RF

Index No.

THE STATE CORPORATION COMMISSION OF KANSAS

SCHEDULE GLk

THE KANSAS POWER AND LIGHT COMPANY
(Name of Issuing Utility)

Replacing Schedule GLk-6/86 Sheet 2

Kansas - Rate Area "k"
(Territory to which schedule is applicable)

which was filed June 20, 1986

No supplement or separate understanding shall modify the tariff as shown hereon.

Sheet 2 of 2 Sheets

OTHER TERMS AND CONDITIONS

1. Service hereunder is subject to the Company's General Terms and Conditions as approved by the State Corporation Commission of Kansas.

2. For customer's required to maintain a 70% or greater load factor, service under this schedule will not be permitted at lesser levels; however, the Company may, at its option and for a limited period only, permit a minimum of 65% load factor when it appears there are mitigating circumstances, and that the customer's usage will thereafter reach or exceed 70% load factor.

Schedule 8.4-1

Commission File Number 154608-U

Issued February (Month) 25 (Day) 1987 (Year)

Effective April (Month) 7 (Day) 1987 (Year)

By STEVEN L. KITCHEN (Signature of Officer) Vice President (Title)

FILED APR 2 1987

THE STATE CORPORATION COMMISSION OF KANSAS

By Secretary

MI-791



Strowbridge Reservoir and the proposed campus area A, viewed from the south at 3,000 feet.