

Volume 1

# Executive Summary



## Kansas

Site Proposal for the Superconducting Super Collider (SSC)



# Site Proposal for the Superconducting Super Collider

## *Kansas*

### Volume 1

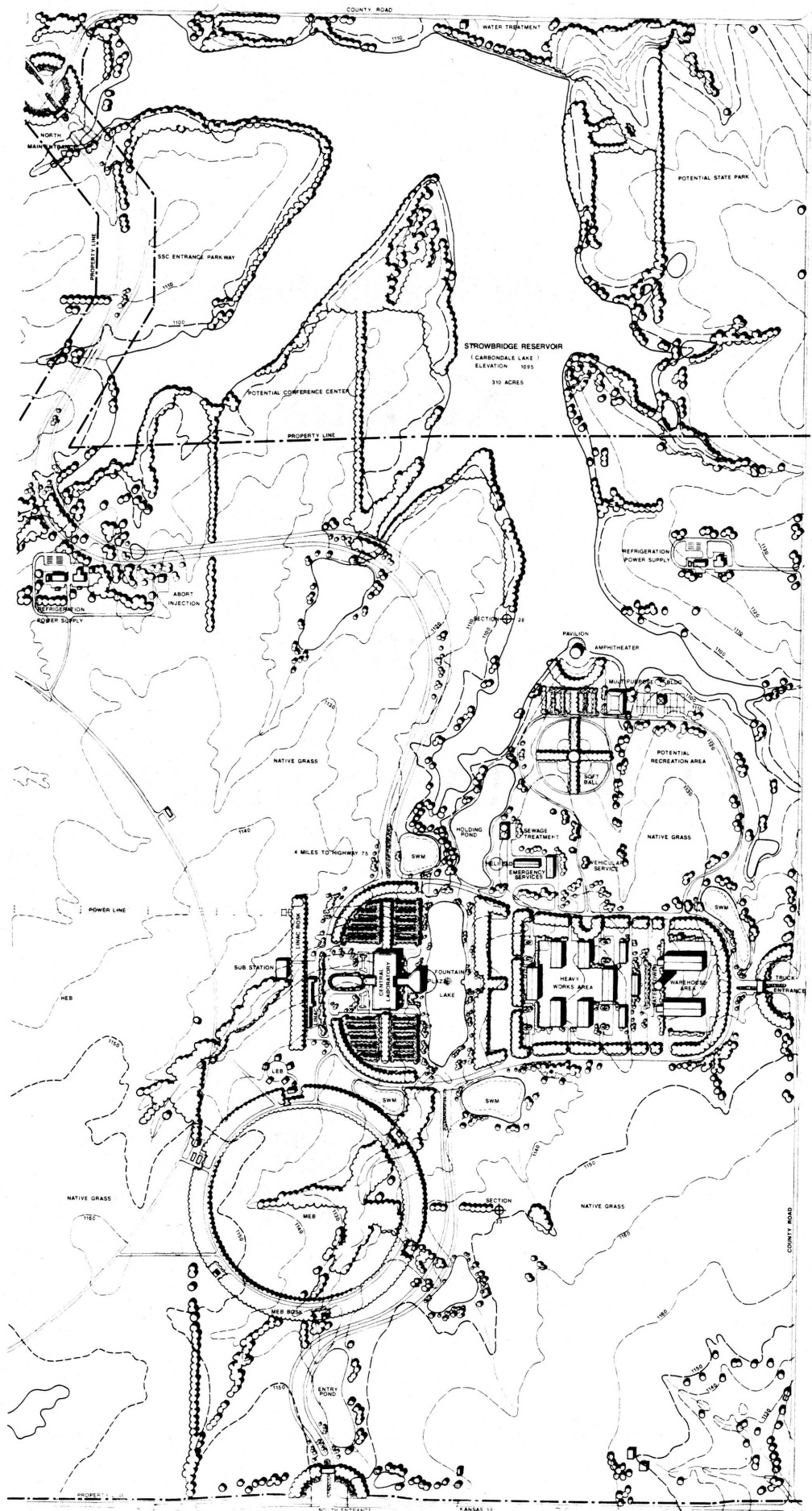
## Executive Summary

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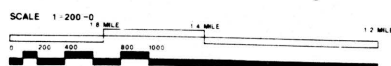
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Cover art from the original painting "*Explosion of Creation*" by Kansas artist Philomene Bennett

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Campus-area Site Plan  
 Super Conducting Supercollider Site Proposal *Kansas*







Strowbridge Reservoir and the proposed campus area A, viewed from the south at 3,000 feet.



## 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.



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# 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

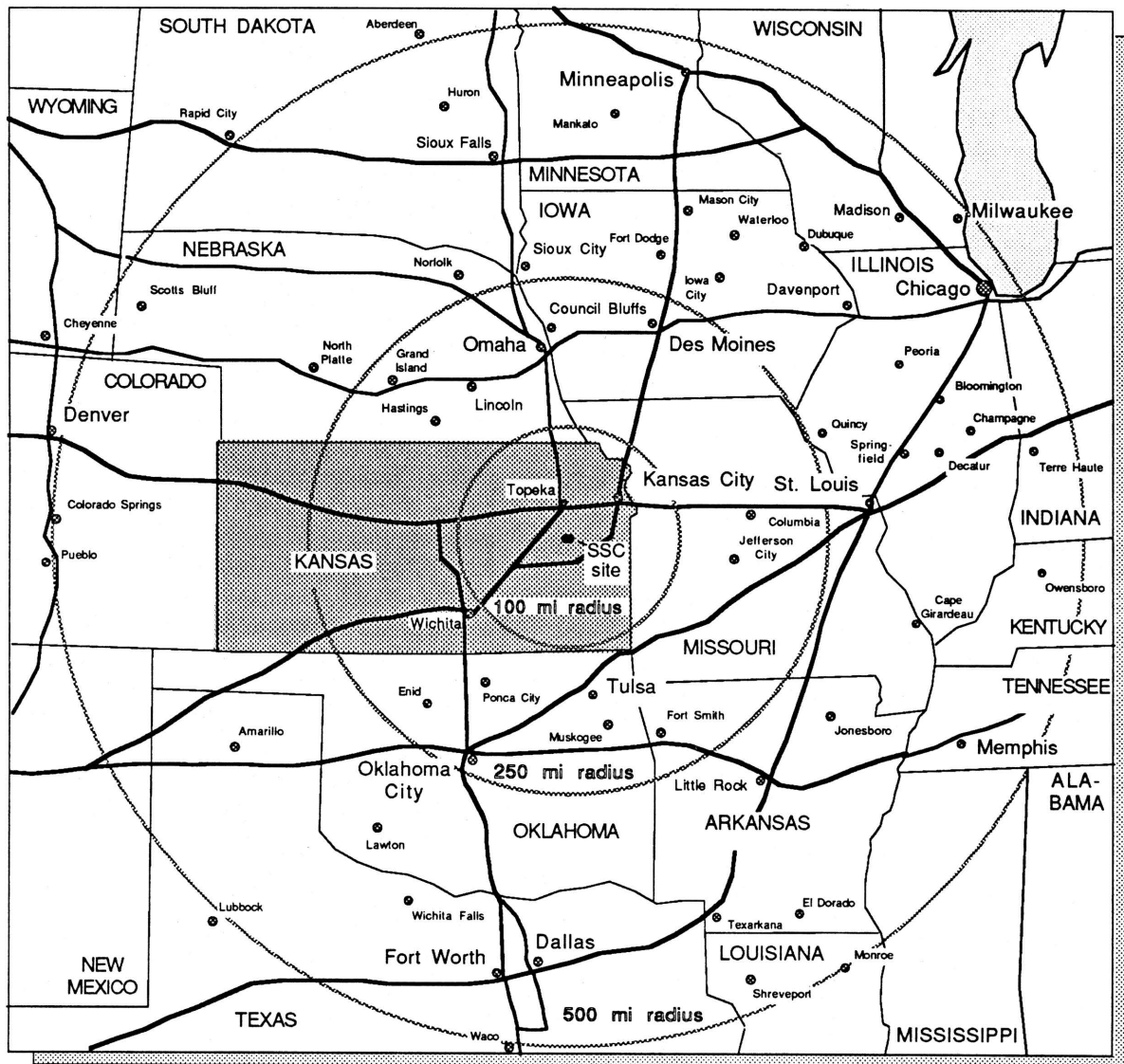


FIGURE 1.1--PROPOSED SITE FOR THE SUPERCONDUCTING SUPER COLLIDER IN KANSAS AND CITIES WITHIN A 500-MILE RADIUS.

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.



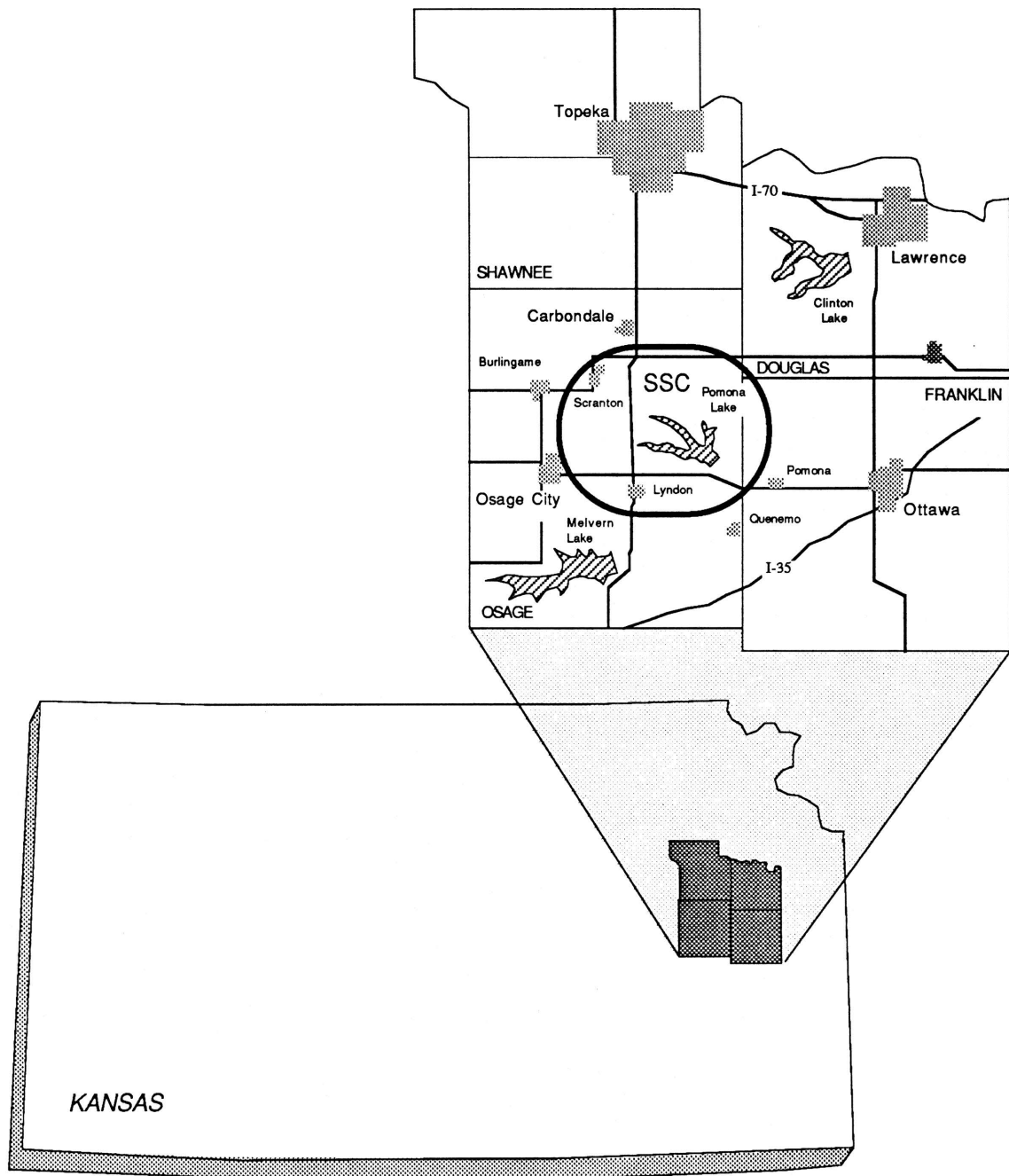


FIGURE 1.2—LOCATION OF PROPOSED SSC SITE WITHIN FOUR-COUNTY AREA OF NORTHEAST KANSAS.

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.

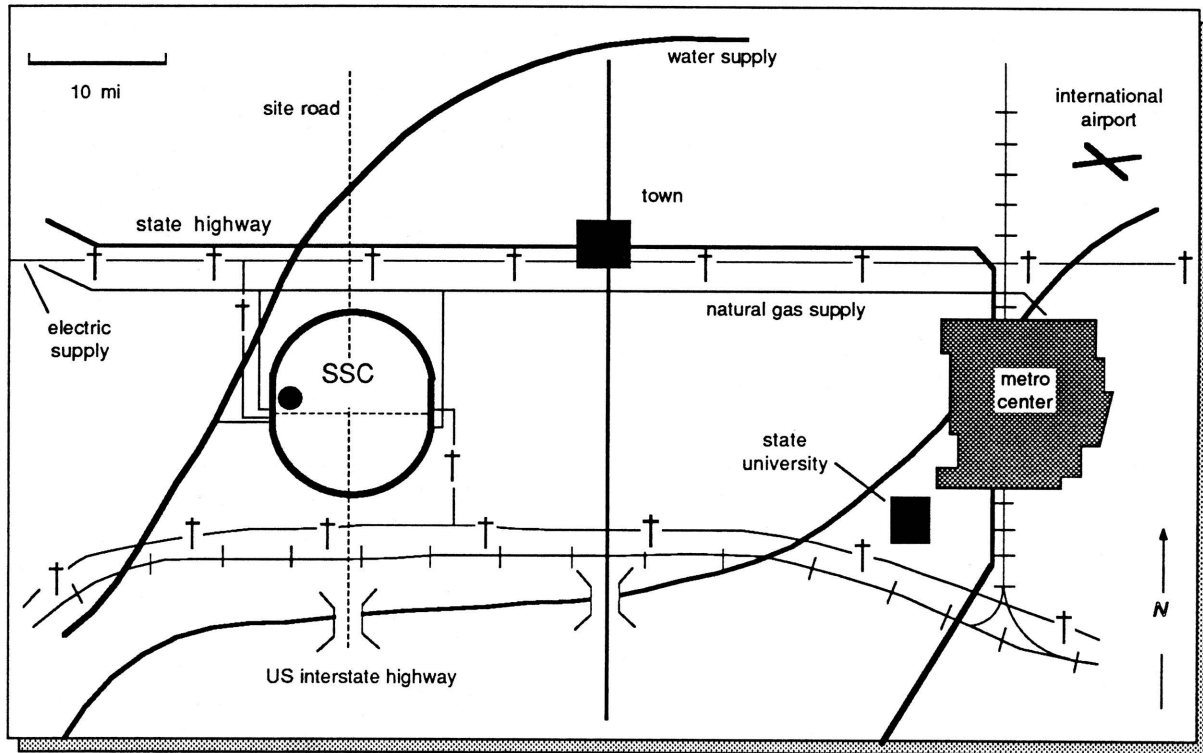


FIGURE 1.3--DOE CENTRAL DESIGN GROUP'S IDEALIZED CONCEPTUAL SITE OF THE SSC.

## 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  $95^{\circ}38'3''$  west and latitude  $38^{\circ}41'51''$  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.



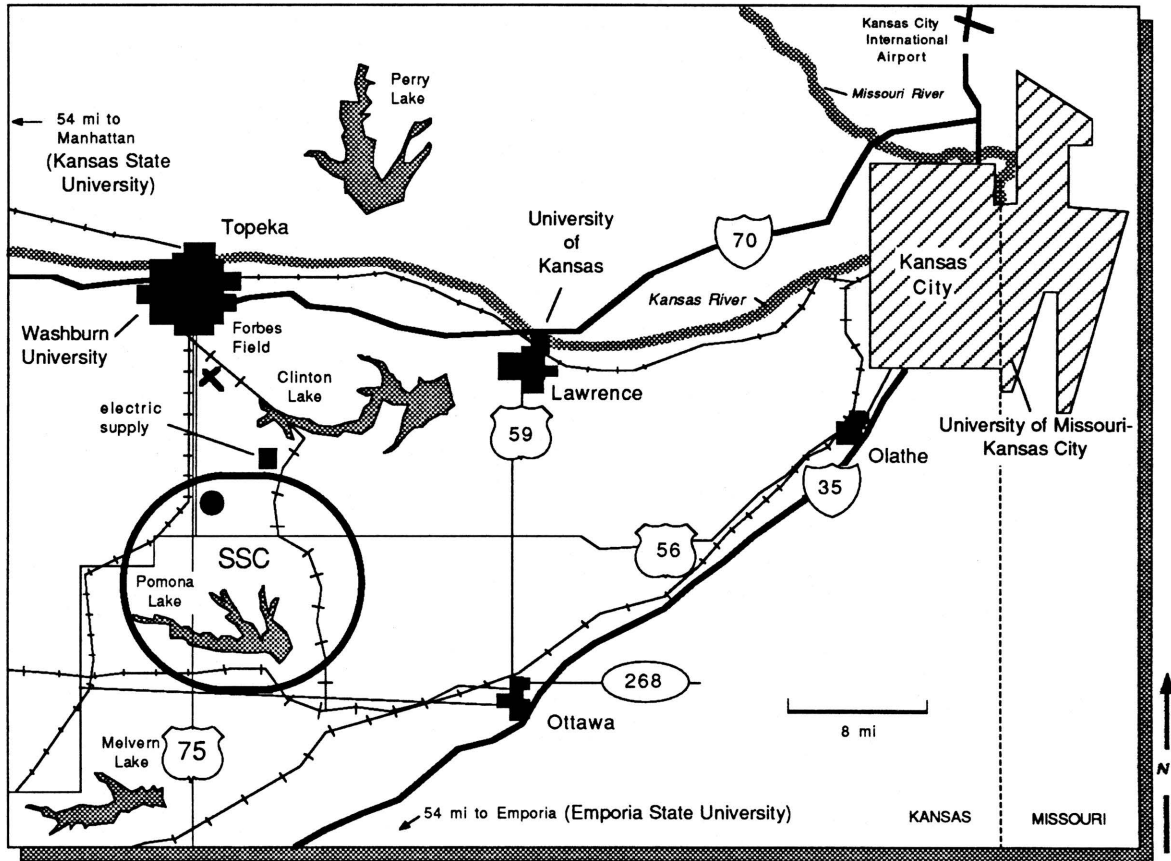


FIGURE 1.4—KANSAS PROPOSED SITE FOR THE SSC.

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 de-

commissioning 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 ori-

entation 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.