 Science, 5/13/94

DOE Ponders Yet More Uses for SSC

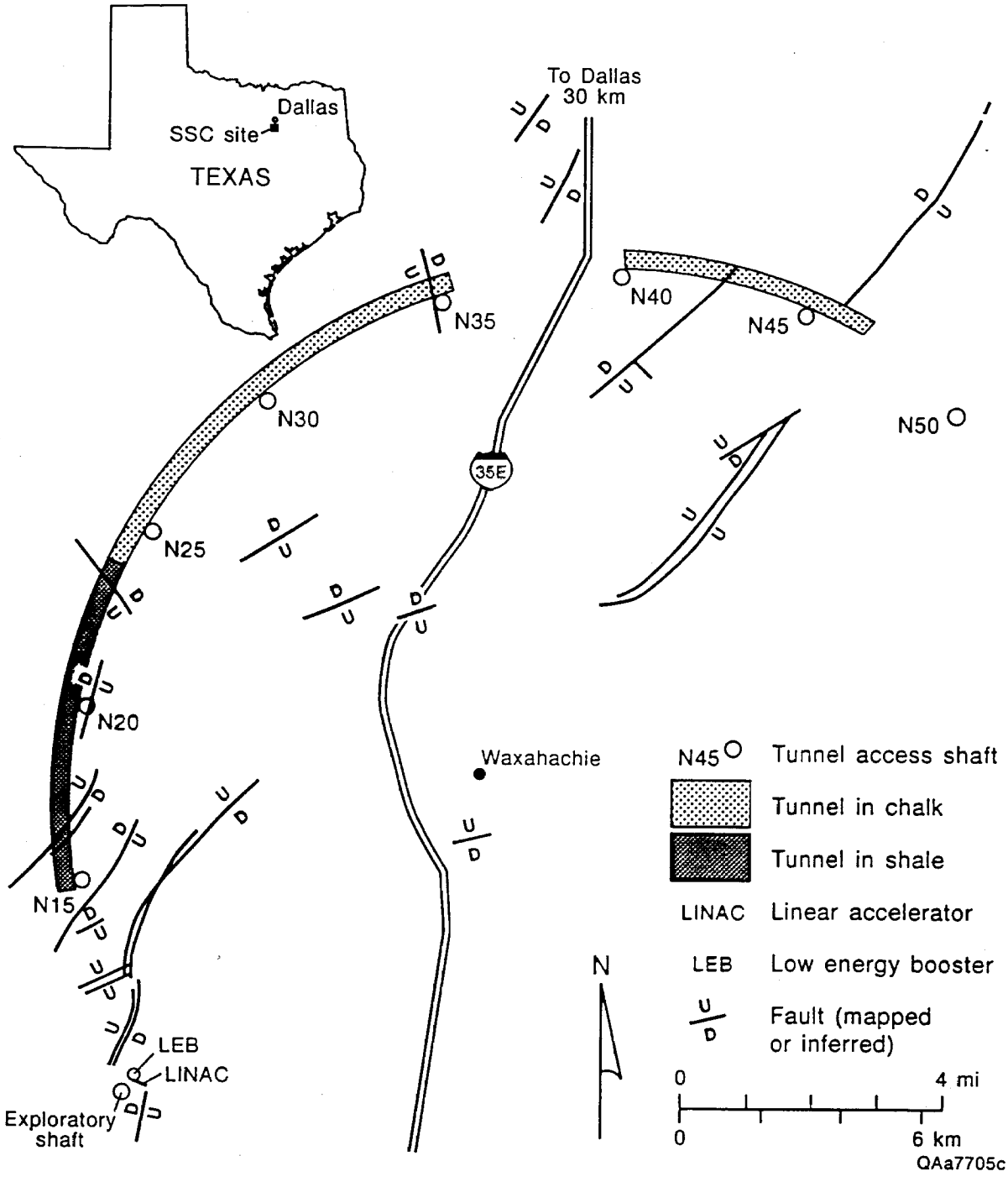
Scientists sometimes had trouble explaining why the Superconducting Super Collider (SSC) should be built. But now that Congress has killed the unfinished particle accelerator, there is no shortage of ideas for putting its Texas corpse to use. Last week the Department of Energy (DOE) announced grants ranging from $25,000 to $150,000 for six "follow-on" proposals. And that's in addition to four projects already under study in Texas. The six proposals, chosen from among 34 ideas submitted, are as follows:

- An experiment using the SSC's powerful superconducting magnets to measure the effective index of refraction for light of different polarizations in a strong magnetic field, proposed by a group of Texas researchers;
- Research to study gas convection and turbulence at low temperatures using the SSC's cryogenic facilities, by the University of Oregon;
- A geotechnical research facility to study the rock exposed in the 12 miles of tunnel already dug, by the University of Wisconsin and the Lawrence Berkeley National Laboratory;
- A research and science education center, using the SSC's computer facilities, engineering facilities, and mechanical shops, by the University of Texas;
- A plan to share SSC personal computers and workstations with minority institutions and network them to the lab's central computer facility, by the Tuples Collaboration and Particle Detector Research Center; and
- A Regional Industrial Technology Institute at the SSC site, focusing on training, manufacturing, and technology development, by a group of companies and education centers in three states.

Meanwhile, the Texas National Research Laboratory Commission, which managed the state's $1-billion investment in the project, is reviewing proposals for a regional supercomputer center, a cancer research facility, a center for superconductivity research, and prairie restoration at the Texas site. The commission has a DOE grant of up to $6 million to explore the proposals.

The ideas may be fresh, but the prospects for any follow-on project are far from certain. Legislators have warned the agency not to start expensive new projects or to funnel money to Texas in the guise of an orderly termination of the lab (*Science*, 25 March, p. 1681), and last week the congressional General Accounting Office (GAO) released a report concluding that DOE's request for an additional $180 million to shut down the SSC was "not justified." GAO recommended that Congress withhold funding for any projects whose costs are not yet known. DOE officials declined to comment, saying they had not yet officially received the GAO report.

–Christopher Anderson


Dallas
SSC site
TEXAS
To Dallas
30 km
N35
N30
N25
N20
N15
N40
N45
N50
35E
Waxahachie
LEB
LINAC
Exploratory
shaft
N
N45 Tunnel access shaft
Tunnel in chalk
Tunnel in shale
LINAC Linear accelerator
LEB Low energy booster
Fault (mapped
or inferred)
0
4 mi
0
6 km
QAa7705c

The Charge – Workshop will be successful if we create several pages of "bullets" and associated narrative sentences.

- Develop science plan for environmental research in SSC tunnels.
  - Define objectives.
  - Define facility and central experiments.
  - Show how program fits into current state-of-the art.
- Develop management plan.

The Approach

- What are outstanding questions that can be answered in SSC tunnels?

- What integration can occur among sub-disciplines – hydrology, geochemistry, geophysics, and rock mechanics – to provide vertical monopoly from site characterization to flow and transport prediction.

- Can the facility serve to improve public understanding of the subsurface environment?

- Can the science program help predict long-term consequences of tunnel closure plan?

EXAMPLE QUESTIONS

- GEOPHYSICS - Can subsurface fractures be characterized for flow and transport prediction?

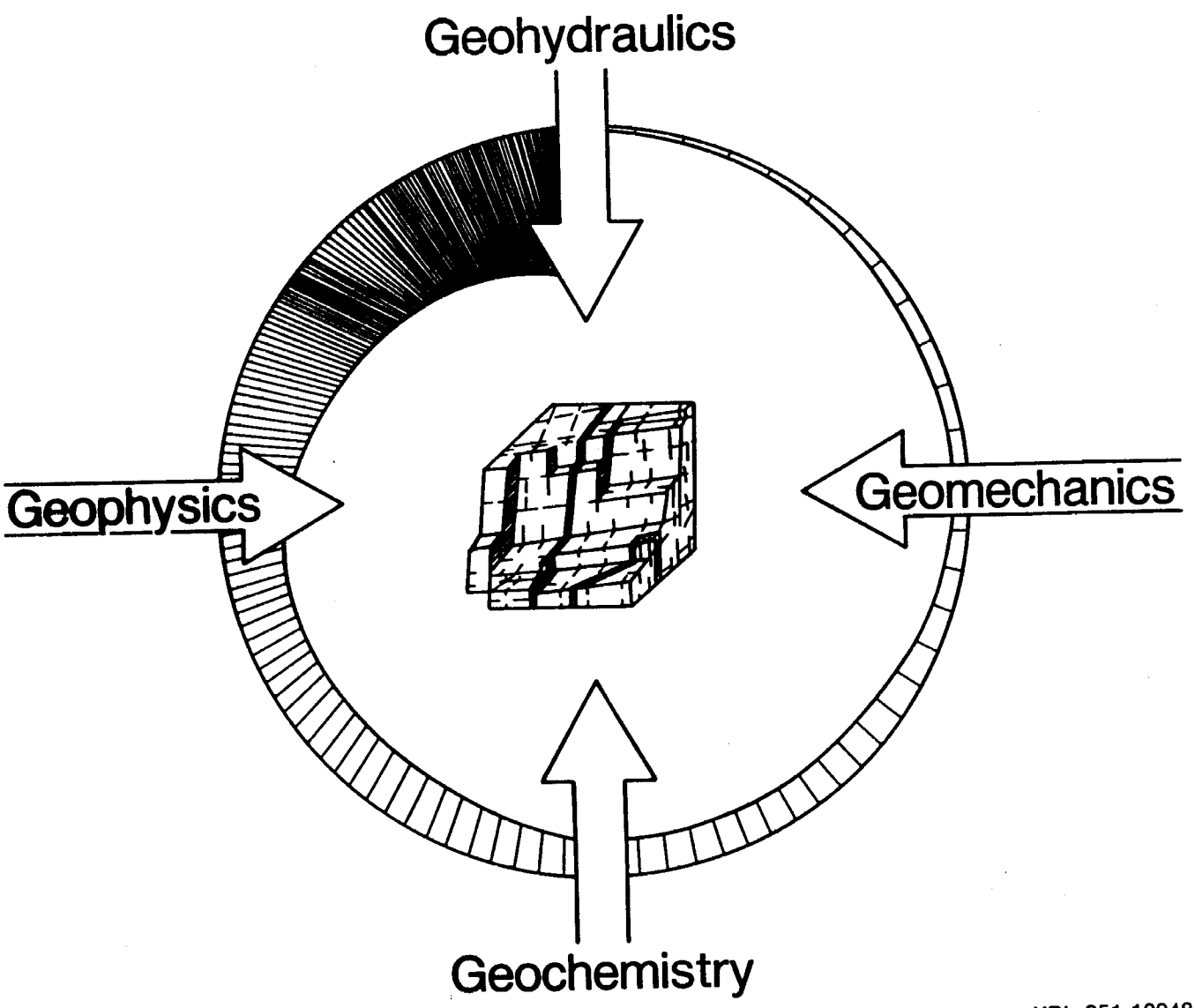
- GEOCHEMISTRY- Can chemical processes on fracture surfaces and degree of matrix diffusion be characterized for different solutes?

- HYDROGEOLOGY - What is effect of scale on flow and transport (REV, multiple porosity, dispersion, etc.)?

- BIOREMEDIATION - How do fractures affect bioremediation processes?

- ROCK MECHANICS - Can fractures be predicted in weak shales and chalks and then related to fluid flow? What is long-term mechanical behavior of shale?

- TUNNELING - Can improved understanding of geotechnical processes lead to better and cheaper tunnel construction and maintenance?



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GEOSCIENCE RESEARCH ISSUES AND OPPORTUNITIES

GEOCHEMISTRY - Chemical transport in underground

- Definition of groundwater flow paths
- Prediction of hydraulic flow paths and associated mass transport properties
- Mineral recovery from rock matrix

GEOHYDROLOGY - Fluid flow in fractured rocks

- Physics of flow through fractured rock masses
- Coupled thermal-hydraulic effects
- Geostatistics in characterizing fractured rocks
- Fluid storage in underground openings

GEOMECHANICS - Coupled effects of perturbations

- Strength and deformability of rocks
- Measurement of stress in rock masses
- Behavior of fractures in rock masses
- Strength of fractured rock

GEOPHYSICS - Deep probing of earth's crust

- Geophysical monitoring of mechanical behavior
- Long baseline, low frequency measurements in a controlled environment

ENERGY AND ENERGY-RELATED APPLICATIONS OF EARTHLAB

- Underground siting of hazardous chemical and nuclear manufacturing.
- Storage of hazardous chemical and nuclear materials and wastes.
- Siting of hardened military operations, weapons, and underground (seismic/electrical) communications.
- Underground storage of gas and oil.
- Direct exploration of ore forming processes.
- Direct exploration of oil and gas reservoirs.
- Underground storage of thermal and magnetic energy.
- Improvement of excavation and mining technology.
- Exploitation of oil shale.