

**NATIONAL GEOSCIENCE
DATA REPOSITORY SYSTEM**

**PHASE III: IMPLEMENTATION AND OPERATION
OF THE REPOSITORY**

**SEMIANNUAL PROGRESS REPORT
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ABSTRACT

The NGDRS has attained 72% of its targeted goal for cores and cuttings transfers, with over 12M linear feet of cores and cuttings now available for public use. Additionally, large-scale transfers of seismic data have been evaluated, but based on the recommendation of the NGDRS steering committee, cores have been given priority because of the vast scale of the seismic data problem relative to the available funding. The rapidly changing industry conditions have required that the primary core and cuttings preservation strategy evolve as well.

A Steering Committee meeting held on November 30, 2000 focused on current achievements, how the situation in the petroleum industry affects the NGDRS activities, and the nature of the study by the National Research Council on data preservation. AGI remained actively involved in assisting the National Research Council with background materials and presentations for their panel convened to study the data preservation issue. The GeoTrek metadata catalog system continues to expand and attract new users. Current GeoTrek revision efforts are being retargeted given the identification of new open source technologies which will provide for a flexible, user-friendly GeoTrek, Version 3.

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Introduction

All scientific and technical investigations require access to basic fundamental data. The capture and long-term preservation of data are required to address a wide range of scientific issues. The National Research Council released a report entitled *Preserving Scientific Data on Our Physical Universe (1995)* that took a broad look at the challenges of scientific data preservation and management in Federal Agencies. The report concluded "a general problem prevalent among all scientific disciplines is the low priority attached to data management and preservation by most agencies. Experience indicates that new research projects tend to get much more attention than the handling of data from old ones, even though the payoff from optimal utilization of existing data may be greater." No discipline is in greater need of an increased focus on data preservation than the geosciences, where private-sector downsizing and public-sector budgetary constraints have combined to jeopardize vast quantities of valuable geoscientific data critical to our understanding of the Earth's environment and natural resources.

The American Geological Institute's (AGI) National Geoscience Data Repository System (NGDRS) project was initiated in the face of the fact that billions of dollars worth of domestic geoscience data is in jeopardy of being irrevocably lost or destroyed as a consequence of the ongoing downsizing of the U.S. energy and minerals industry. Preservation and access to domestic geological and geophysical data are critical to the energy security and economic prosperity of our nation. The goal of the project is to act before valuable data are permanently displaced.

The NGDRS will serve as an important and valuable source of information for the entire geoscience community and the nation at large for a variety of applications, including environmental protection, water resource management, global change studies, and basic and applied research. It will also contain critical data that enable domestic energy and minerals companies to enhance their exploration and production programs in the United States for improved recovery of domestic oil, gas, and mineral resources.

A model for transferring data from the private to public sector is provided by the 1995 transfer of Shell Oil's core facility in Midland, Texas to the University of Texas at Austin. Shell deeded its collection of 2.2 million linear feet of core and cuttings from some 39 states to the university along with its warehouse and a \$1.3 million endowment to cover annual operating expenses. All of these data entered the public domain for the first time.

Executive Summary

With the recent increases in oil prices, the NGDRS has seen a distinctive increase in activity and interest, particularly since October 2000. This new spike in activity is the result of increased activities in the petroleum sector, including new funding to examine infrastructure issues facing many of the companies over the long-term. Over the past two years, the petroleum industry has been focused on short-term issues and cost-savings. However, with increased activities and continued industry consolidation, longer time horizons have reemerged.

Despite a lack of available public repository space, the NGDRS has press ahead in coordinating transfers both to existing facilities and to virtualize some transfers, whereby previously private data is made public. This has resulted in the NGDRS attaining 72% of its targeted cores and cuttings transfers, with over 12M linear feet of cores and cuttings now in the public domain. Additionally, large-scale transfers of seismic data have been evaluated, but bases on the recommendation of the NGDRS steering committee, cores have been given priority because of the vast scale of the seismic data problem relative to the available funding. The rapidly changing industry conditions have required that the primary core and cuttings preservation strategy evolve as well.

AGI held a steering committee meeting, with a focus on current achievements, how the situation in the petroleum industry affects the NGDRS activities, and the nature of the study by the National Research Council on data preservation. AGI remained actively involved in assisting the National Research Council with background materials and presentations for their panel convened to study the data preservation issue. The GeoTrek metadata catalog system continues to operate. Current revision efforts are being retargeted given the identification of new open source technologies with will provide for a flexible, user-friendly GeoTrek, Version 3.

Experimental Approaches

The National Geoscience Data Repository System, Phase III is an operational project focused on coordinating and facilitating transfers of at-risk geoscience data from the private sector to the public domain. As such, the project does not have a consistent “experimental approach.” During the first half of the FY01, no efforts undertaken required experimental approaches to arrive at specific conclusions.

Results and Discussion

National Academy of Science Geoscience Data Preservation Panel

The Board on Earth Sciences and Resources staff of the National Academy of Science secured sufficient funding in the Fall 2000 to commence a study on the issue of geoscience data preservation. The study formally began in March 2001, with an initial meeting of the panelists on April 6, 2001. AGI worked closely with the NRC in developing its project scope:

With budget cuts and the downsizing of the U.S. oil industry and some federal agencies, combined with the lack of space in private and public museums, the preservation of geoscience data (e.g., cores, cuttings, maps, paper reports, digital data) is becoming a critical issue for federal agencies, academic researchers, museums, institutes and industry. This study will (1) develop a strategy for determining what geoscience, paleontological, petrophysical and engineering data to preserve; (2) examine options for long-term archival of these data; (3) examine 3-5 accession and repository case studies as examples of successes and failures; and (4) distinguish the roles of the public and private sectors in data preservation. The overall goal of the study is to develop a comprehensive strategy for managing geoscience data in the United States.

The membership of the NRC committee is:

Christopher Maples, University of Indiana (**Panel Chair**)
Beth Driver, National Imagery and Mapping Agency
Robert Schafer, Kinross Gold
Kevin Biddle, ExxonMobil
Robert Sneider, Sneider Exploration
Sally Zinke, Society for Exploration Geophysicists
Thomas R. Janecsek, Florida State University
John Steinmetz, Indiana Geological Survey
Linda R. Musser, Penn State University
Warren Allmon, Paleontological Research Institute

The expected outcome will be a report of the National Academy of Science detailing a recommended national geoscience data preservation strategy, including an assessment of the need and priorities for preservation. The NRC staff has targeted completion of the study by the end of 2001 with a report released in 2002.

The Board on Earth Sciences and Resources has raised support for this study from various agencies and private organizations, including the US Department of Energy, US Geological Survey, National Science Foundation, Smithsonian, POSC, and AGI.

NGDRS Steering Committee

A steering committee meeting for the NGDRS was held on November 30, 2000 in Houston Texas, chaired Robert Merrill of Samson. The committee discussed the current status of the NGDRS, recent data transfers, improvements in GeoTrek, and future directions for the program. Representatives from major companies, federal and state agencies, including DOE, and several

smaller companies were present. The full report of the committee meeting is attached in *Appendix A*.

Discussions with DOSECC

Discussions with DOSECC began in the second quarter of 1999. DOSECC is a consortium of 48 universities and research laboratories that are engaged in research on onshore crustal studies and drilling techniques. Given DOSECC's interest in onshore cores, AGI made contact with their Executive Director, Dennis Neilson.

DOSECC currently has two major operations underway, drilling 5000 meters of core from the flank of Mauna Kea and deploying a mobile floating drill rig for coring of lake bottoms, such as the Great Salt Lake. DOSECC recognizes the long term scientific core preservation issues and recognizes that all projects face similar circumstances in being unable to find data repositories willing to accept the core for curation. This situation represents a potential point of collaboration.

With their focus on core and equipment, DOSECC has found itself with an immediate need for storage space. DOSECC, in communication with AGI, contacted the agent for the former Toole Army Depot west of Salt Lake City to inquire about potential storage space. At this point the property prices are too high to be viable for acquisition by either DOSECC or the NGDRS. However, DOSECC is leasing a smaller lot within the same property now for storing cores and equipment in sea containers. Depending on the success of commercializing Toole, DOSECC and AGI are keeping the option of a facility in Utah open.

Data Transfer Status

NGDRS Cores and Cuttings Transfers

Source	Liner Ft. of Cores & cuttings
Unocal	1,109,016
Chevron (Cores)	934,157
Chevron (Cuttings)	10,038,898
Shell	450,000
Altura	85,000
Total To Date	12,617,071

NGDRS Paleontological Transfers

Source	Section Equivalent (ft)
Chevron	43,200,000

NGDRS Seismic Data Transfers

Source	Line-miles
Phillips	2000

Public Data Integrated into the NGDRS

Source	Boxes/Logs
Texas BEG cores	100,656
Texas Well Logs	87,772
Texas RRC	552,524
Alabama	1,091
Oklahoma	4,604
MMS	44,455
US Geological Survey Cores	370,000
Total	1,161,102

Total Priority Data Transfers Relative to Phase I Targets

To date for the NGDRS project, nearly three-quarters of the volume of identified at-risk cores and cuttings have been transferred into the public domain. The NGDRS steering committee established priority to cores and cutting data given their particular economic risk, and thus to date, that data type has been the primary transfer target. A test case regarding seismic transfers was performed, but given the vast volumes of data that needs to be transferred and converted, current funding levels preclude major initiatives into that area.

Data Type	Phase I Target	Phase III Transfers	Percent Completion
Cores & Cuttings	17.5 M liner feet	12.6 M liner feet	72%
Seismic Data	100 M line-miles	961 line-miles	<1%
Paleo Data	Not quantified	43.2 M section ft.	>100%

Unocal/Spirit Energy Cores and Cuttings

Unocal's onshore cores and cuttings are now cataloged in the NGDRS metadata catalog. The metadata is house at the American Geological Institute in its database servers. This transfer covered 2082 core records, representing 1,109,016 linear feet of core from across the nation. Quality control by AGI allowed the inclusion of 1198 core records into the metadata catalog. Additional work on the data has determined the geolocating of the additional 884 core records is not possible given the existing metadata. However, the data is included in the system for those queries not dependent on geographic location. Unocal continues to store their core and cutting holdings at C&M Storage in Schulemburg, Texas. Users of the GeoTrek metadata catalog can arrange for access to listed cores by contacting C&M Storage directly.

Unocal/Spirit Energy Utah Core Transfer

The NGDRS is assisting in the transfer of Unocal's Utah cores and cuttings from Shulemburg, Texas to the new core repository at the Utah Geological Survey. Unocal has made as a condition of this transfer, that all of Utah's data holdings, including the Unocal data, need to be listed in GeoTrek. In March, the Utah Geological Survey sent a copy of its metadata to the American Geological Institute for review for integration into GeoTrek. The review is ongoing and integration of the Unocal Utah cores is expected in 2001.

Chevron Cores and Cuttings

Chevron transferred its metadata catalog of over 180,000 core and cuttings records to the NGDRS. These records represent 934,157 feet of cores, over 10M feet of cuttings, 14M washed paleo sample bags, 41,942 paleontology slides, and 56,621 oil samples.

Similar to the arrangement by Unocal, Chevron is maintaining the cores and cuttings at the C&M Storage facility. However, all of the cores and cuttings in the database are now released to the NGDRS for inclusion in the metadata catalog. The metadata records of the Chevron cores and cuttings are undergoing quality control at this time. Full integration of the data into the metadata catalog, including geolocation of the records will occur in 2001.

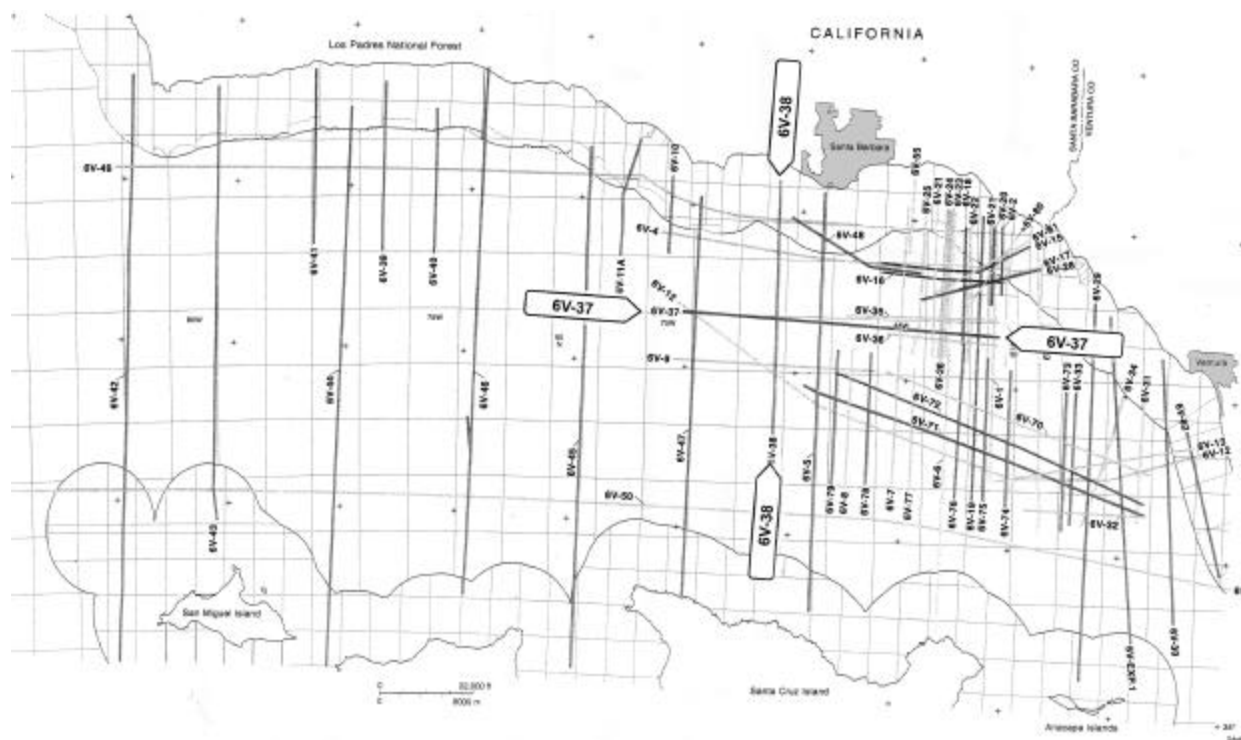
Altura Midland Core Facility

Altura has transferred ownership of some 80,000 boxes of core and cuttings to the Bureau of Economic Geology at the University of Texas at Austin in 2000. The construction of a new repository in Midland was completed and physical movement of core and cuttings boxes began in October 2000. The metadata records for the Altura core was processed and integrated into the BEG's metadata catalog under direction of the NGDRS. The consolidated BEG catalog will be reintegrated into GeoTrek.

Phillips Seismic Tapes

Phillips Petroleum has transferred selected seismic holdings for the Santa Barbara Channel in California to the NGDRS. AGI completed a pilot project to evaluate the feasibility and costs for digitizing and transcribing the analog data to current media and format. The data was stored on 1-inch analog tapes, for which there are few known working readers. A selected number of tapes, representative of the Santa Barbara channel were transcribed and processed to check for validity. The processed seismic lines demonstrated excellent quality and provide a new set of data for the geoscience community to use. Copies of the tapes are available on request for private sector and academic researchers. A map of the transferred seismic lines is below.

Figure 1. Map of transferred seismic lines from Phillips Petroleum



Marathon Oil Cores and Cuttings

Marathon Oil approached AGI concerning the contribution of their cores and cuttings to the NGDRS from the Littleton, CO facility. That facility has been slated for closure, and their Permian Basin cores and cuttings were also in danger of being discarded. After initial discussions with Marathon representatives, the company decided to contract with C&M Storage to hold and maintain their data holdings in Schulemberg, TX. Discussions are ongoing regarding the incorporation of non-proprietary holdings of Marathon into GeoTrek using similar arrangements as those with Chevron and Unocal. Approximately 100,000 boxes of core are at issue in these discussions.

Texaco/Chevron Midland Proposal

Texaco's Midland operations have approached AGI concerning the development of a Permian Basin-wide core facility, including identification of non-proprietary cores and cuttings for release to the public. Texaco convened a meeting in October with the major Permian Basin operators, the Texas Bureau of Economic Geology, New Mexico Bureau of Mines and Mineral Resources, and AGI to discuss this concept. Both Texaco and Chevron have indicated a strong desire to move forward expeditiously with this process. The other operators, including Marathon, are taking it under consideration. Two potential approaches to this effort are evident. First, if only Texaco and Chevron are willing to proceed, they could arrange with the Texas BEG through the NGDRS to construct a new building at the former Shell Midland facility and endow the data's maintenance. However, if other companies commit to the program, identification of a new site in Midland is planned with the development of a regional public repository, run either by an NGDRS/AGI

developed organization or the Texas BEG. A decision regarding this effort is expected from Texaco and Chevron in the summer of 2001.

Operating the Metadata Catalog

The operation of the metadata catalog continued during the first half of 2001. The following databases are currently available on the metadata catalog:

- Fairfield Seismic
- A2D Well Logs
- MMS Well Logs
- Alabama Eastern Gulf PTTC Well Logs
- BEG Well Logs
- BEG Cores
- Oklahoma Geological Survey Cores
- MMS Block and Lease Boundaries
- Texas Railroad Commission Well Logs
- Unocal Onshore Cores and Cuttings

The current access statistics are provided, as well as Project to Date (PTD).

	1998	1999	2000	2001(*)	Total
NGDRS Website Hits	30,911	61,152	48,656	11,487	152,206
Unique Visitors to NGDRS	1331	4336	6,218	1895	13,780

(*) Statistics to 31 Mar 2001

Redesign of GeoTrek

GeoTrek, the metadata catalog for the NGDRS went through an entire redesign. This redesign revolved around 2 areas: backend remote database integration and an improved user interface.

The back-end remote database change was completed and implemented with the integration of the Unocal cores. The system now is capable of querying remote database systems over the Internet, allowing data holders to control the availability and extent of data accessible through the metadata catalog. Additionally, it allows transparent integration of additional information, such as core disposition, core photos, analytical data, etc., to be readily accessible by the end-user.

A new user interface system has been identified in the Open Source community that will neatly tie into the GeoTrek metadata catalog. A concerted effort will be engaged to integrate this widely used interface, which has the benefit of being well-tested on a number of browser technologies, into the end-users GeoTrek experience.

Enhanced targeting of public databases

In 2001, AGI will be accelerating its efforts to integrate existing public databases into GeoTrek, mainly through interactions with the State Geological Surveys. Among the primary targets for full integration into the system include:

- **U.S.G.S. Core and Cuttings, Denver, Co - Acquired**
- **Kansas Geological Survey Cores and Cuttings, Lawrence, KS - Acquired**
- **Utah Geological Survey Cores, Salt Lake City, UT - Acquired**
- Kentucky Geological Survey Cores and Cuttings, Lexington, KY
- Kentucky Geological Survey Coal Sample Cores, Lexington, KY
- Illinois Geological Survey, Bloomington, IN
- Indiana Geological Survey, Champaign, IL
- West Virginia Economic and Geological Survey, Morgantown, WV

Conclusions

With the recent increases in oil prices, the NGDRS has seen a distinctive increase in activity and interest, particularly since October 2000. This new spike in activity is the result of increased activities in the petroleum sector, including new funding to examine infrastructure issues facing many of the companies over the long-term. Over the past two years, the petroleum industry has been focused on short-term issues and cost-savings. However, with increased activities and continued industry consolidation, longer time horizons have reemerged.

Despite a lack of available public repository space, the NGDRS has press ahead in coordinating transfers both to existing facilities and to virtualize some transfers, whereby previously private data is made public. This has resulted in the NGDRS attaining 72% of its targeted cores and cuttings transfers, with over 12M linear feet of cores and cuttings now in the public domain. Additionally, large-scale transfers of seismic data have been evaluated, but bases on the recommendation of the NGDRS steering committee, cores have been given priority because of the vast scale of the seismic data problem relative to the available funding. The rapidly changing industry conditions have required that the primary core and cuttings preservation strategy evolve as well.

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References

None applicable.

Appendix A – Report of the 30 November 2000 Steering Committee Meeting

Attendees:

Bob Merrill, Samson
Art Almendarez, Phillips Petroleum Company
Amy Blackwell, Texaco
Mike Bradshaw, Conoco
George Dellagiarino, Minerals Management Service
Jim Denton, BP Amoco
Tammy Dickenson, National Research Council
Bob Graebner, AGI
Purna Halder, NPTO/Department of Energy
Jean Hamilton, Marathon Oil Company
Christopher Keane, AGI
Richard Lane, National Science Foundation
Barney Lewis, US Geological Survey
Dennis Nielson, DOSECC
Make Padgett, EEX
Doug Ratcliff, Texas Bureau of Economic Geology
George Smith, Chevron
Emily Stoudt, Texaco
Scott Tinker, Texas Bureau of Economic Geology
Jan Van Sant, AGI Foundation
Greg Wahlman, BP Amoco
Larry Woodfork, AGI

Christopher Keane, AGI

A review of the NGDRS project, from its initial phase with a DOE grant in 1994 to the current stage 2 of Phase III was given. A number of major data contributions in 2000 to the NGDRS were discussed:

1. Phillips donated approximately 1000 miles of Santa Barbara Channel seismic data that has been transcribed from Analog tapes to modern high-density tapes.
2. Altura transferred 85,000 boxes of Permian Basin Core to the Bureau of Economic Geology's core facility in Midland, Texas. This included funds to endow the maintenance of the core and construction of an additional building to house the new data.
3. Unocal contributed metadata for its onshore United States cores and samples stored at C&M storage in Schulenberg. After Quality Control, 1200 of the 2082 records have been integrated into Geotrek.
4. Chevron contributed metadata for 180,447 core records for their US wells.

Geotrek 2 was developed during 2000, providing an improved interface as well as returning to the original intent of a fully distributed database system. The Chevron and Unocal data were the first sets of metadata integrated remotely. Currently the BEG's database and the Kansas Geological Survey database are being tested for remote integration. This approach allows the data providing organization complete control over their data listings in GeoTrek, and substantially reduces the cost

of entry for State Geological Surveys. The additional of up to 12 other State Surveys is targeted in 2001. Geotrek is accessible through the AGI website, <http://www.agiweb.org>.

Bob Graebner, AGI

Phillips donated about 2200 miles of Santa Barbara Channel Seismic data that was considered obsolete. The data was shot in 1965-66 and acquisition was both with air guns and marine vibroseis. About 1200 miles of data was useless because no navigation data is available. 961 miles of the data was successfully transcribed to DLT tapes in SEGy format. The tapes will be distributed to a number of state surveys and universities, whom will then make them available to the public at large.

Rich Lane, NSF and AAPG Committee for Preservation of Cores and Samples

The AAPG committee's objective is to publicize the value of core and sample preservation. Plans for 2001 are to expand efforts to publicize the importance of sample preservation and seek ways to assist existing repositories. To this end the committee has sponsored a policy position with AAPG on Core Preservation and AAPG's sponsorship of the NRC Study on Core Preservation. New projects include increasing industry's awareness of preservation options, including an AAPG Explorer article and to publish a fact sheet on environmental regulations and tax implications for core and sample contribution to the public domain. Plans are underway to sponsor an AAPG technical session or forum at the 2002 AAPG meeting in Houston.

Doug Ratcliff, Texas Bureau of Economic Geology

The Texas BEG currently has core repositories in Austin and Midland as well as a geophysical log facility that is the repository for the Texas Railroad Commissions logs in Austin. Currently, new core additions are limited unless the donating company contributes \$4/box for an operational endowment and funds to construct additional space. The fees to examine core at the BEG is \$3.00/box cost to pull the core, rental costs of \$39/day per layout table and \$300 per day for an examining room. About 10 people per month use the BEG facilities.

Emily Stoudt, Texaco

Texaco is looking for options for its Permian Basin core. Currently Texaco stores its Midland core in 5 different facilities, each with different storage costs.

Location	boxes	Annual cost	Cost/box
Texaco Midland: no labor	2000	\$1875	\$0.93
Texaco Midland: with labor	2000	\$3347	\$1.67
Core Lab, Midland	923	\$1980	\$2.15
Pierce Leahy, Denver	17,383	\$21,630	\$1.25
C&M Storage, Schulenberg	1,666	\$1488	\$0.90

Texaco is trying to establish momentum within the industry to consolidate all Permian Basin cores into a single facility in Midland, which would be accessible to the NGDRS for cores the companies deem non-proprietary. Likewise, this would yield substantial cost benefits for all Midland operators. Texaco indicated that they are in discussion with Chevron to proceed with the Texas Bureau of Economic Geology if the other operators will not join in in the near future. Texaco has a total of 40,000 boxes, Chevron has 50,000 and Marathon 60,000 in Midland, with a total industry

holdings on the order of 1,000,000 boxes. Marathon announced that they will be consolidating all of their core storage to Schulemberg, Texas as they close their Littleton, CO facility.

Tamara Dickenson, NRC

The prospectus has been approved for a study of the issues regarding the preservation of geoscience data. The study is now 80% funded and initial activities can proceed. The first meeting is expected in early 2001 with the work plan calling for 4 meetings of the yet-to-be-named committee over 18 months. Sponsors include: DOE, NSF, USGS, DOE-Yucca Mountain, Smithsonian, AGI, POSC, GSA, Paleontological Society, and AAPG. To date there is no industry support, primarily because of the industry view that the study will take too long to address the pressing current needs of data preservation. An industry support letter was drafted to try to gain additional financial support for the work.

Dennis Nielson, DOSECC

DOSECC continues with its annual drilling projects. Recent activity on paleoclimate data is generating long cores (800 m) in lakes that will need to be specially stored. Drilling site include Salt Lake, Bolivia and Malawi and the material will be sent to the University of Minnesota for work and storage, but they do not have sufficient operational archiving facilities to handle the projected data storage needs.

Robert Merrill, Samson

The NGDRS effort is making progress with the development of GeoTrek, the metadata catalog of the holdings contributed by industry to the public domain. However, the significant costs for physical repository space continues hamper full-scale data transfers. Many companies continue to focus on cost savings by reducing storage needs through transfer of data to the public domain. However, public funding of sample storage space is very limited and generally very little new space is available.

A central national core repository would cost between \$1 million to \$1.5 million to operate, requiring \$20-25 million endowment. These operating costs are above the facility build-out costs to develop additional repository space. The endowment and the repository should be managed by an independent non-profit organization, such as AGI and an independent foundation.

Ongoing Issues

1. Schulenburg storage facility continues to be a possibility for core and sample storage.
2. Most existing core storage facilities are near or at capacity.
3. The continuing issue of what to do and how to pay for material for which companies are not willing to pay.
4. What is the means to develop the support to ensure ongoing maintenance of data storage.
5. Increase advertising of the NGDRS project is needed to expand its visibility.
6. A subcommittee of Bob Merrill, Jean Hamilton and Marcus Milling will explore management solutions to present to the NGDRS Steering Committee at the next meeting.