HOMESTAKE DUSEL AND SANFORD LABORATORY NEWSLETTER

Dear Homestake Collaboration,

Welcome to the December monthly newsletter for Homestake DUSEL and South Dakota's Sanford Laboratory. We are always glad to receive your input on news, links to news articles, upcoming workshops, conference notices, scientific updates, information concerning the Collaboration, and other highlights relevant to our shared goal.

Important Dates

January 2010: Draft Experiment Development Plans Due to the Project Office

February 9-11, 2010: Annual DUSEL Review- Berkeley

March 19-20, 2010 - FARRM Collaboration Meeting - Berkeley

Geotechnical Site Investigations - Update

Dr. Zbigniew J. Hladysz reports that the drilling program and the *in-situ* testing within the current RESPEC contract have been successfully completed. A total of 4,363 ft (seven holes) have been drilled, cored (oriented), surveyed and imaged with the televiewer. This footage consists of 87% of the 5,000 ft planned total footage (see Table 1 and Figure 1 below).

Table 1. DUSEL Drilling Summary

Hole	Approximate Length (ft)	Proximate Location
3	402.3	LC 1
N	503.1	LC 1
M	502.8	LC 1
D	1,312.5	LM 1–3
C	589.4	LC 3
B	603.0	LC 2
J	450.0	LM 3
Total	4,363.1	

The data is being processed, interpreted and evaluated. The *in-situ* stress measurements included a total of six stress measurements (four in the amphibolite and two in the rhyolite).

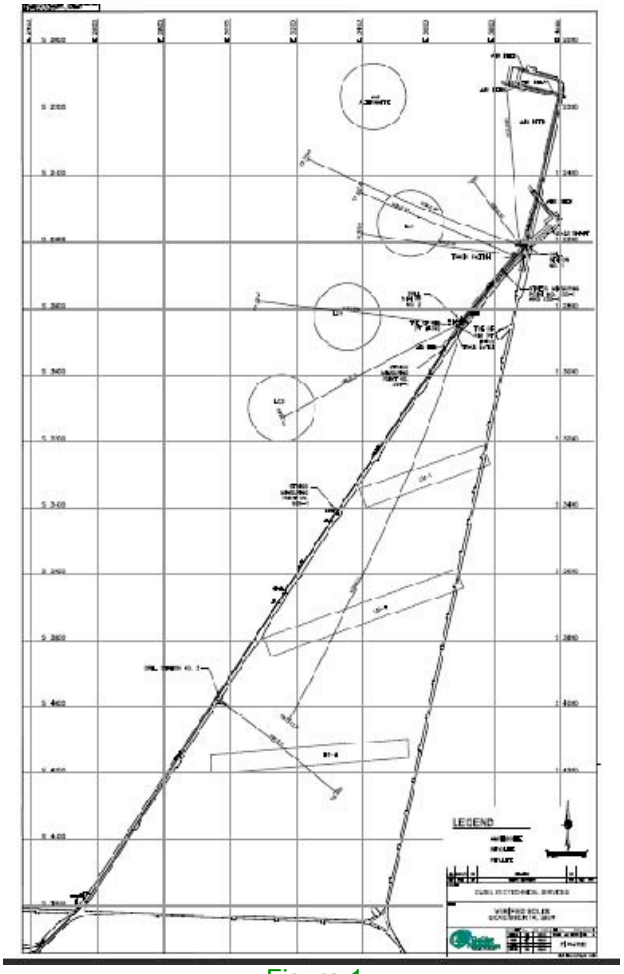

Figure 1

Even though the basic *in-situ* site investigations at the 4850 level needed for the preliminary design-have been essentially completed, there are still some additional tasks and activities that are either taking place underground or will be implemented soon.

These activities include the following:

- Ground water monitoring program using the existing DUSEL drill holes.
- SDSTA (LUX/Majorana) excavation convergence monitoring program.
- SDSTA (LUX/Majorana) blast vibrations monitoring program.

Other geotechnical activities, in progress, include numerical modeling and laboratory tests.

Figure 2: Dr Zbigniew Hladysz (left, front) with Golder Associates team which conducted inspection of the site

DUSEL Project meetings at Berkeley

During the first two weeks of December, a round of meetings has taken place at the Berkeley DUSEL Project Office.

The Red Team review met December 9-11 in preparation for the NSF Annual Review, which will take place in Berkeley February 9-11, 2010. The Red Team assessed the preparation and readiness of DUSEL Project Team and their presentations with a focus in preparing the Project baseline to match the Spring 2011 NSB review timeline. Berkeley and South Dakota presenters participated onsite or by teleconference. Members concentrated on the EH&S aspects of both DUSEL and Sanford Lab as well as Project Overview, Facilities, Science Requirements and Flow-down, Preliminary Design Plan, Management Design, and Project Controls. Thanks to reviewers who took time out from their busy schedules to come to Berkeley!

On December 15, while many of the DUSEL team from Berkeley and South Dakota attended the American Geophysical Union (AGU) meetings in San Francisco, Deputy Project Manager/DUSEL Mike Headley conducted a Communications, IT, Security, Monitoring Workshop at the Berkeley DUSEL Project Office. Attendees included members from the Berkeley DUSEL Project Office, South Dakota School of Mines, SD Science & Technology Authority, ARUP, HDR, and Golder to discuss communications, IT, security, and RFID tracking (and other related monitoring topics) requirements and design concepts. The purpose of this workshop was to begin identifying the facility requirements and operations and design concepts in this area to help guide the facility design process.

Simultaneously, the NSF made a site visit to Berkeley for two days, December 15 and 16. This included program officers Drs. Steve Meador and David Lissauer who met with DUSEL Principal Investigators, Project Team and other DUSEL staff as well as UC Berkeley officials. The NSF team was accompanied by Dr. Jonathan Kotcher (DOE).

On December 16 and 17, Richard DiGennaro led the Requirements Planning meeting at the Berkeley.

Another highlight of the week included the DUSEL Office Warming and Holiday Party on December 16 held at the DUSEL Project Office. Approximately 70 people attended for a celebratory cake, drinks, and other snacks.

SANFORD UNDERGROUND LABORATORY AT HOMESTAKE

New sand filters

Figure 3: Yardney sand filters replace Baker sand filters.

As of December 1, new blue Yardney sand filters began removing red oxide from water being pumped from underground. They are connected to the electronic monitoring system and took over from 32 smaller (green) Baker filters which were rentals. The Yardney filters remove iron from the water faster, cheaper, and more effectively. This iron-removal system will be used for the remainder of the dewatering project.

Underground Monitoring Site

The Deep Underground Gravity Laboratory, DUGL, has eight monitoring sites underground, including the one pictured. They are using seismometers, protected by sheets of foam insulation, to determine whether Sanford Lab is quiet enough for a large gravity-wave detector. So far results are promising.

Figure 4: Monitoring site at 2000 level

Update at 4850 Level

Figure 5: Infrastructure Tech Darin "Augie" Davison operates jumbo drill at rock face of new drift to Davis cavern.

Baseline Geomicrobiology Research Extends to Drill Holes at the 4850 Level

On December 1, several members of the geomicrobiology research team descended to the 4100 and 4850 levels to sample water emanating from fractures intersected by drill holes at each level. Exploring the depths that day were Dr. Duane Moser of the Desert Research Institute, Dr. David Bergmann, Dr. Cynthia Anderson, Erin Writer, and Forrest Cain of Black Hills State University, and Dr. Sookie Bang, Fletcher Meyer, and Tess Jones from South Dakota School of Mines and Technology.

Exploration of the microbial environment deep within the Earth's crust is almost totally unexplored. The unique geomicrobiological research opportunities at the DUSEL/Sanford Laboratory at Homestake have facilitated the formation of a multidisciplinary and multi-institutional research team to explore the biodiversity of the deep subsurface biosphere. Fracture-intersecting drill holes at the 4850 level facilitate exploration of the naturally occurring microbial flora inhabiting the pristine understudied ecosystems, and the microbe-mineral associations and interactions deep within the Earth's crust. Furthermore, because microbes from the Earth's surface have been unintentionally introduced into the depths of the Earth's crust by mining activities, the site offers the ability to study the phenomenon of short-term evolution of microbial life both at the ecosystem level and at the species level.

Figure 6: Tess Jones (left front) and Dr. Anderson (right front) collect samples.

The larger geomicrobiology research team includes Dr. T.C. Onstott (Princeton), Dr. Susan Pfiffner (University of Tennessee, Knoxville), Dr. Tom Kieft (New Mexico Tech), Dr. Larry Stettler (South Dakota School of Mines and Technology), Dr. Kirk Nordstrom (US Geological Survey), Dr. Ramanus Stepanauskus (Bigelow Laboratory for Ocean Sciences), and Dr. Mark Conrad (Lawrence Berkeley National Lab).

LUX Surface Laboratory

On December 15, media focused on the LUX lab. Four local television stations, South Public Radio, the Black Hills Pioneer, the Rapid Journal and its Lawrence County Journal covered Governor Mike Rounds' visit to the LUX surface laboratory. The event received statewide coverage.

Figure 7: Dr. Rick Gaitskell and Gov. Mike Rounds peer into the "detector pit" in the LUX Lab. Charles Michael Ray of S.D. Public Radio at left.

Also at LUX, on December 12, a two-man video crew from the Harvard-Smithsonian Center for Astrophysics visited the surface lab, and then followed Dr. Rick Gaitskell to the 4850 Level. They filmed for "Physics in the 21st Century," an online course for high school physics teachers. The LUX experiment at the Sanford Lab will be featured in a segment on dark matter. The online course will have 13 half-hour episodes, and will be free. More details next year.

Sanford Lab water level - Updates

As of November 30, the water level at the Sanford Underground Laboratory at Homestake was 5,044 feet underground, about 16 feet lower than in mid-November and 514 feet lower than the high-water mark reached last year.

This past week's drop in water level was the first significant drop in several weeks. The water level had been maintained between 5,020 and 5,030 feet underground while crews prepared install new pumping stations on the 5,000-foot level. That preparation continues, and the pumps will be installed in January.

Sand Management

Underground Ops Foreman Jack Stratton reports that mucking on the 5000 Level has progressed to the chiller drift.

Operations crews also devised a way to remove sand from the 3650 Level sump. Sand slurry will be piped down to a 3800 Level drift, where it will be blocked by a series of five walls of decreasing height. Sand settles behind the walls and water decants over the top.

Education and Outreach at Sanford Lab

Integrating Underground Science into the Physics Curriculum

Teachers in South Dakota are excited about DUSEL and eager to include DUSEL-related content in their classroom. This is quite a challenge in a typical high school physics class, which is usually so full of required topics that concepts developed in the last 100 years get only passing attention, if at all. In South Dakota, most high school physics teachers spend a week or two on nuclear physics and no time at all on particle physics. In Sioux Falls, South Dakota's largest school district, a workshop was held last fall to address this challenge. The workshop resulted in teachers proposing a pilot course in conceptual modern physics, which will include DUSEL physics concepts. Their School Board accepted this, and the course is now under development to be offered at two high schools next fall. If any members of the DUSEL science community have had experience with helping develop such a course, please contact pnorris@sanfordlab.org; we would like to get your input before our next planning meeting in late January. Also, any recommendations for good modern physics textbooks appropriate for high school teachers would be appreciated. Thank you!

DUSEL IN THE NEWS

SHS Physics Teacher Involved With Sanford Lab Research - *By Wendy Pitlick* (Black Hills Pioneer) - Wednesday, December 2, 2009

SPEARFISH — For Spearfish High School physics teacher Steve Gabriel, the prospect of getting involved in research at the Sanford Lab is a real dream come true. And Gabriel is realizing that dream. Recently, Gabriel began collaborating with scientists from the University of Wisconsin, Montana Tech, and other areas of the country to install fiber optic sensors in the Sanford Lab….

To read more about this story or other stories of DUSEL in the news:

Black Hills Pioneer: http://www.bhpioneer.com/

The Sanford Lab's Race for Dark Matter, Aired on South Dakota Public Broadcasting.
http://www.sdpb.org/tv/shows.aspx?MediaID=57534&Parmtype=RADIO&ParmAccessLevel=sdpb-all

Lawrence County Journal: Sanford Lab, LUX researchers join forces to find dark matter first
http://www.rapidcityjournal.com/news/article_48e74b66-e9ae-11de-a978-001cc4c002e0.html

News at Princeton: Going underground for a climate solution
http://www.princeton.edu/main/news/archive/S26/05/67C32/index.xml?section=topstories

ENVIRONMENT, HEALTH & SAFETY

Holiday Safety

Enjoy the holiday season, but don't drink and drive, and don't let someone else drink and drive.

Holidays for Pets: Guard trees and plants from pets. Pine needles, poinsettia sap. and other holiday plants can be dangerous if ingested.

The holidays should be a time of joy, not stress. Balance your parties, shopping, visiting, card writing and gifting. Don't eat / drink / spend / do too much.

**** FOR INFO ON WEATHER CONDITIONS IN SOUTH DAKOTA, CALL: 605-722-0002***

Cultural Advisory Committee

George Campbell was elected as a new Fellow of the Institute of Hazardous Materials Management (IHMM) during the annual meeting of IHMM's Board of Directors, held December 11 at the Marriott Tysons Corner in Tysons Corner, Virginia.

Significant contributions which are considered by the Board for election of an individual as a Fellow of the Institute include accomplishments such as: Developing or advancing a new technology, apparatus or device; Implementing a new management principle, methodology, procedure, or technique; advancing the value, importance, and recognition of the profession in the marketplace or the media; training or developing training materials that improve workforce knowledge and skills; and/or, performing an honorable or heroic deed.

IHMM (www.ihmm.org) is a nonprofit organization that for over twenty-five years has been protecting the public's health and safety through the administration of credentials recognizing professionals in the government, private, and corporate sectors.

DUSEL Planning: *Sanford Center for Science Education*

Market analysis and content development: David Heil and Associates, Inc. (DHA), an Oregon-based science education consulting group, was the winning firm for both the preliminary market analysis and content development solicitations. DHA specializes in the development of science-based educational programs, products and services and has a reputation for excellence in facilitation, collaborative planning and public outreach. They work with non-profit organizations, governmental agencies and corporations to design, launch and evaluate educational and public outreach initiatives, helping those organizations build capacity for sustaining long-term impact from their initiatives and position them to thrive in a competitive environment and challenging future. DHA will produce an initial market analysis report based on industry benchmarks, to be completed in January, and an initial content report, to be completed in February. The content report will be informed by a workshop scheduled for January bringing together national experts in science education.

NEW STAFF

Rich Grubb recently began working in the DUSEL Project Controls office at UC Berkeley. His primary responsibilities will be to build the DUSEL Integrated Project Schedule (IPS). The IPS is instrumental to the Earned Value Management System, which is required on the project.

Since 1990, Rich has worked in many capacities of Project Management. Most of his experience is on government projects sponsored by the DOD, DOE, NSF, COE, and DOT. Some of the favorite projects he has worked on include:
ALMA http://www.almaobservatory.org, NSLS-II http://www.bnl.gov/nsls2/ and the building of the new Bonneville Navigation Lock on the Columbia River: http://oregoniron.com/hydro.htm (please note pic in lower right corner).

Favorite Quote: "There is a principle which is a bar against all information, which is proof against all arguments and which cannot fail to keep a man in

everlasting ignorance - that principle is contempt prior to investigation." - *Herbert Spencer*

JOBS

Postdoctoral Research Fellow, Particle Nuclear Physics, University of British Columbia, TRIUMF. Human Resources Dept., Competition #238 recruiting@triumf.ca. Deadline: December 31.

Postdoctoral Research Position in experimental particle/nuclear physics., University of South Dakota. Apply online: https://yourfuture.sdbor.edu. Contact: Vincente Guiseppe, vincente.guiseppe@usd.edu

Postdoc or Research Associate position in neutrino physics, Physics Dept, Stanford. Contact Ms. Marcia Keating, Varian Physics, Stanford, CA 94305-4060; email (mkeating@stanford.edu).

Postdoctoral Position in Neutrino Physics. Los Alamos National Laboratory. For further info, visit: (http://www.lanl.gov/science/postdocs/). Ref Job number: 218567 or contact Dr. Steve Elliott, elliotts@lanl.gov

Postdoctoral Research Associate position: Physics Dept at Brookhaven National Lab. Participate in group's activities including design of Long Baseline Neutrino Experiment at DUSEL in South Dakota. Under the direction of S. Kettell, Physics Dept. For more info: http://www.bnl.gov/hr/careers/ - Click on Search Job List. Ref: Job ID # 14944.

Faculty Position in Experimental Astroparticle Physics. Dept of Physics & Astronomy, University of Alabama. For more info: http://physics.ua.edu, or Prof. Jerry Busenitz, busenitz@ua.edu.

WORKSHOPS / CONFERENCES

International Workshop on Stopping and Manipulation of Ions and related topics (SMI-10), Stanford University – March 21-24, 2010

This workshop continues the series of meetings begun in 1986 in Konnevesi, Finland. The scope of these meetings has followed the evolution and expansion of the techniques related to the stopping of energetic ions in noble gases and the use of noble gases to manipulate ions and atoms, mostly in research involving unstable nuclides. In addition SMI 10 will cover topics of interest for the extraction and identification of ions produced in rare nuclear decays, such as would be desirable for ultra-low background double-beta decay experiments. The many new developments since the last workshop in this series in 2006 in Groningen warrant the organization of this meeting. The SMI-10 Workshop aims at providing a status of the field as well as guidance for future developments. For more information, contact Ms. M. Keating, mkeating@stanford.edu.

Newsletter Editor: Melissa Barclay
Contributors: Kevin Lesko, Bill Harlan, Dr. Cynthia Anderson, George Campbell, Rich Grubb, Peggy Norris, T.C. Onstott, Wendy Pitlick, and Zbigniew Hladysz.

Photo Credits: Fig.1 and Table 1: Dr. Zbigniew Hladysz; Fig 2: Vicki Franzen, RESPEC; Figs. 3-6: Bill Harlan; Fig. 7: Dr. Dan Akerib of the LUX Collaboration.

NEW ADDRESS

UC Berkeley
DUSEL Project Office
2440 Bancroft Way, Suite 303
MC 1295
Berkeley, CA 94720-1295
Fax: 510-642-2258

HOMESTAKE DUSEL CONTACT INFORMATION

University of California at Berkeley
Kevin T. Lesko: 510-642-0147
KTLesko@berkeley.edu
Melissa Barclay: 510-642-2244
mbarclay@berkeley.edu
http://www.lbl.gov/nsd/homestake/
South Dakota Science and Technology Authority
Ron Wheeler, Executive Director
Mandy Knight, 605-722-8650, x222
MKnight@sanfordlab.org
http://www.sanfordlab.org/
South Dakota School of Mines and Technology
William Roggenthen: 605-394-2460
William.Roggenthen@sdsmt.edu

HAPPY HOLIDAYS!