HOMESTAKE DUSEL AND SANFORD LABORATORY NEWSLETTER

Dear Homestake Collaboration,

Welcome to the July monthly newsletter for Homestake DUSEL and South Dakota's Sanford Laboratory. We would like 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

August 31 – September 2: Internal Design Review, South Dakota

October 1-3: DUSEL S4 Workshop, Lead, SD

October 4-6: LBNE Collaboration Meeting, Lead

LCAB Visits Homestake Mine Site

During the week of July 6-10, the Large Cavity Advisory Board (LCAB) made its first visit to the Homestake mine site. The primary purpose of the visit was to see conditions of the recently de-watered 4850 level of the mine where the large cavities will be located. All members of the board spent most of the first day underground on the 4850 and 4100 levels, and two members of the board returned underground for more detailed inspections on the third day of the visit.

During review meetings and discussions with UCB, LBNL, SDSM&T, DUSEL Geotechnical Advisory Committee (GAC) and RESPEC/Golder personnel, details of the large cavity design, construction and operation were explored at length. The LCAB made its own evaluation of geologic and geotechnical conditions on the 4850 level and carried out preliminary numerical analyses of the construction and support sequences deemed appropriate for the cavities. This work resulted in a series of recommendations on the proposed siting for the cavities and for the investigations required to confirm or to modify this location.

Figure 1: Dr Ed Cording, LCAB member, points out proposed cavity locations adjacent to the Yates shaft on 4850 level plan

The LCAB noted the damage to the rock surrounding the existing mine excavations as a result of blasting. A strong recommendation was made that all future excavations should be carried out using controlled blasting techniques.

Figure 2: Example of results of well-executed controlled blasting. Photo taken on 240-m level of Atomic Energy of Canada Underground Research Laboratory at Pinawa, Manitoba. Lack of blast damage and minimal use of rock support evident in this photograph.

On Thursday July 9, a review meeting was held with Joe Dehmer, Jon Kotcher and Rick Fragaszy of the National Science Foundation. LCAB and GAC were able to express its satisfaction with the work carried out to date as well as confidence that large cavities on the order of 60m in span could be built safely in a zone adjacent to the Yates shaft on the 4850 level of Homestake mine.

Long Baseline Neutrino Experiment Collaboration Meeting

The Long Baseline Neutrino Experiment (LBNE) involves sending a beam of neutrinos through the earth from Fermi National Accelerator Laboratory (FNAL) in Batavia, IL to DUSEL, 1300km away. Neutrino interactions would be detected in a series of huge new cavities on the 4850L with total volume 300,000 m^3 filled with very pure water, and a second detector whose active volume is 20,000 tons of exceptionally pure liquid argon at 87°K (-305 °F).

Their purpose is to measure the frequency at which neutrinos start out as one type or flavor at FNAL and are detected as a different flavor at DUSEL. The two styles of detectors (water and liquid argon) are also sensitive to the decay of protons from which they are made (i.e. protons in hydrogen, oxygen or argon nuclei), supernovae as distant as the Andromeda galaxy, neutrinos from the sun and other astrophysical sources.

The LBNE collaboration meeting in Lead, SD is planned for October 4-6, with 50-100 scientists from around the world attending.

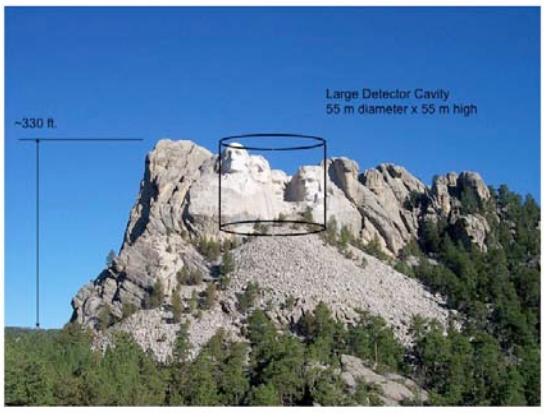

Figure 3: Large Detector Cavity Scale relative to Mount Rushmore

UPDATES

Surface Infrastructure Alterations and Upgrades

On June 25, HDR CUH2A completed on-site assessment activities for 14 of the existing Homestake surface buildings and the surface campus infrastructure and utilities. These assessments document existing conditions and help determine the role of these buildings in the DUSEL surface campus. HDR developed their draft assessment report and presented their findings to the Project on July 9. Cost estimation activities have also been initiated. HDR will provide their final assessment report on July 31.

A contract with Oppenheim Lewis Incorporated was awarded on June 23 through SDSM&T. Through this contract, Oppenheim Lewis will provide project management services to support DUSEL contracting efforts and architectural and design expertise to support campus programming and site master planning.

Site Preparation, Re-entry and Rehabilitation

At the end of June, the underground water level was at 4,971 feet. The next major level–5,000 feet underground—will be the site of a large pump room similar to pumps at the 1250, 2450 and 3650 levels.

The SDSTA finalized a contract for dewatering the deepest levels of Homestake. A large submersible pump will lift water from below the 8000 Level (the lowest) to the 5000 Level.

Infrastructure for Underground Operations and Research Space

Three contract amendments were issued:

The RESPEC geotechnical engineering services contract was amended to provide senior geotechnical engineering support to perform preliminary engineering assessment of the geology at the proposed location of large cavities on the 4850 level. Also, under this amendment, RESPEC will convert a 3D structural model developed by SDSM&T geologists into Vulcan format, perform additional coring and rock testing, and additional mapping of the 4850 Level.

The ARUP underground infrastructure assessment and design contract was amended to update safety training requirements from MSHA to OSHA standards and to expand requirements for inspection and geotechnical assessment of the Ross and Yates Shafts and drifts (i.e. tunnels) that are part of the DUSEL laboratory footprint.

The ARUP contract was amended to also fund development of a detailed, bottom-up preliminary cost estimate for underground construction, including development of a project Work Breakdown Structure, construction schedule, and risk assessment with recommended cost and schedule contingencies.

The Project has initiated preparation of two Requests for Proposals (RFPs) to establish contracts for (1) underground laboratory excavation design and (2) underground laboratory design development. The excavation design RFP was released on June 30 and proposals were due on July 16. The underground laboratory RFP is scheduled for release in early July. In addition to these two new contracts, existing contracts for underground infrastructure and surface facilities and infrastructure will be amended in July to fund preliminary design development activities.

Research Instrumentation and Equipment and Experimental Requirements

Drs. Pat Dobson and Rohit Salve (LBNL) researched potential research sites for CO_2 sequestration experiments. They installed monitoring instruments installed on the 2000, 4850 and 8000 Levels.

Dr. Herb Wang of the University of Wisconsin and colleagues inspected sites at the 4100 and 4850 levels for optical extensometers to achieve accurate measurements of rock movements.

Dr. Stetler re-located his pressure and temperature sensors from the 4550 Level hoist room to the 4850 Level. His sensors now reach to a depth of ~5194 down the #6 Winze.

SANFORD UNDERGROUND LABORATORY AT HOMESTAKE

Sanford Lab water level

The water level at Sanford Underground Laboratory is approaching the 5,000-foot level. Sanford Lab will continue pumping to the 5200 Level using the current system of pumps. When the 5000 Level is dry, technicians will install two large 700 horsepower pumps there. The South Dakota Science and Technology Authority recently approved purchase of a deep-well submersible pump system to lift water from the 8,000-foot level to the 5000.

Figure 4: Homestake gold miners called this the Davis "neutrino tank"

Davis Cavern Dry

The Davis Cavern at the 4850 Level was pumped dry in June. (The cavern sits mostly below the sill of the 4850 Level, so it had to be pumped separately.) Sanford Lab technicians have begun removing the large tank and other steel used for the Davis neutrino detector.

The Large Underground Xenon dark-matter detector will be installed in the Davis Cavern, and the South Dakota Science and Technology Authority will add more than a dozen technicians in July and August to begin expanding the cavern for LUX. That work includes a new drift (tunnel) to provide secondary access to the cavern, excavation of a "transition area" and lowering the cavern floor. The Majorana collaboration also will use the transition area.

Figure 5: Science Liaison Specialist Connie Giroux, left, and Science Liaison Director Jaret Heise, led group to Davis Cavern. Others, left to right: Brian Lowery, Kristal Running Wolf and Peter Lemke, all of Black Hills State University, and George Duffy, University of Tennessee Knoxville.

Figure 6: Davis Cavern at 4850 level. Left to right: Kem Robinson, Kevin Lesko, Joe Dehmer, Jonathan Kotcher, Rick Fragaszy, Bill Roggenthen.

LUX surface lab construction begins

The SDSTA board approved a contract to remodel a Homestake warehouse, converting it into a laboratory and surface assembly facility for LUX. Work began in mid-July, and the building should be available for occupancy by dark-matter researchers by October.

Yates Shaft progress

The main access to Homestake is by two 5,000-foot shafts. Currently, infrastructure technicians, engineers and scientists are using the Ross Shaft, which is open to the 4850 Level, but a contractor has reopened the Yates Shaft to below the 2,300-foot level.

EDUCATION AND OUTREACH

Davis-Bahcall Week

On July 6-10, Sanford Lab hosted a group of 27 students for a summer study program. Ten students won Davis-Bahcall scholarships for a week of study in Europe—at Gran Sasso Laboratory in Italy and CERN in Switzerland, and three weeks at Princeton University. Seventeen other students, called "Summer Scholars" were awarded a week at either Fermilab or Brookhaven. Three teachers also took part.

Kicking off with a media event including Governor Rounds on July 6, students were interviewed by several newspapers and television stations. South Dakota Public Broadcasting followed them around most of the week to document the program for future airing.

Figure 7: Davis-Bahcall Scholars and Sanford Lab/Fermilab/Brookhaven students pose with Governor Rounds

Students attended lectures in basic modern physics and science to be pursued at DUSEL. Lecturers included Dr. Jose Alonso (Sanford Lab), Dr. Peggy Norris (BHSU/Sanford Lab), and Prof. Cynthia Anderson (BHSU), among others. Other lectures via videolink, using the South Dakota DDN, were given by Prof. Tom Schutt (Case Western) and Dr. Anze Slosar (UC Berkeley). The videolink enabled some lectures to be broadcast for summer interns working at BHSU, USD and SDSU. The Berkeley lecture was part of the 2009 Cosmology Workshop taking place at the same time at the Berkeley Center for Cosmological Physics (BCCP). Students were greeted by Nobel Prize winner George Smoot, Director of the BCCP.

Students experienced hands-on activities in nuclear and particle physics and geology (led by Larry Stetler of SDSMT), toured the water treatment plant (led by John Scheetz, SDSTA), and then worked together in small groups to design their own experiments to conduct at the 2000 foot level. The experiments ranged from cosmic and background radiation measurements to testing the properties of mine water to measuring gravity underground.

Students then dispersed to tours and activities at CERN, Gran Sasso, and Frascati Laboratories in Europe and Argonne, Fermilab, Brookhaven, and SUNY-Stony Brook in the US.

The program is funded by the South Dakota Department of Education and a grant from 3M Corp.

Figure 8: Dr. Bill Roggenthen of SDSM&T speaks to audience in Yates Dry during Neutrino Day

Neutrino Day draws 600 plus

On Saturday, July 11, more than 600 people attended Sanford Lab's free science festival, called Neutrino Day. Co-sponsors included the Lead Chamber of Commerce, South Dakota School of Mines & Technology, Black Hills State University and South Dakota Public Broadcasting. The day before the event, South Dakota Public Radio broadcasted a live, one-hour program from the Yates Administration Building at Sanford Lab. Guests included Sanford Lab Director Jose Alonso, Science Liaison Director Jaret Heise and Deputy Education and Outreach Director Peggy Norris.

Figure 9: Steve Rokusek of South Dakota Public Broadcasting at Neutrino Day science festival

The Neutrino Day festival featured hands-on science demonstrations, special showings of the NOVA documentary "Ghost Particles," videos, an animated feature for younger students and guest lecturers, including Dr. Alonso and DUSEL Co-Principal Investigator Bill Roggenthen of SDSM&T. Local media coverage was extensive.

Last year's science festival also drew more than 600 people, and Neutrino Day is on its way to becoming an annual event.

Planning for the Sanford Center for Science Education

Black Hills State University is preparing an RFP for a project manager to coordinate the 'soft' planning for the Sanford Center for Science Education, ie the conceptual and preliminary design of exhibits, programs, and organizational structure of the Center. Soon after the project manager is on board later this summer, RFPs will be issued for a market analysis and more detailed planning of activities to be conducted within the center. Project management of the 'soft' design will complement and help to inform work on facility design.

Microbial Sampling Workshop

During the first week of July, a microbial sampling workshop was held at Sanford Lab, organized by Susan Pfiffner, Univ. of Tennessee Knoxville, Tommy Phelps of Oak Ridge National Laboratory and T.C. Onstott of Princeton University. Cynthia Anderson of Black Hills State University and her students attended, along with Larry Stetler, Bill Roggenthen, and students of Sookie Bang, all of South Dakota School of Mining and Technology, Robert McTaggart and Bruce Bleakley from South Dakota State University.

Figure 10: D.r Pfiffner samples a white filamentous "snotite" on a 4850 level weeping fracture

During the workshop, an anaerobic glove bag was assembled in Anderson laboratory for future sampling projects. During a visit to the 2000, 4500 hoist room and 4850 level, students were trained in water seep measurements, biofilms sampling, and filtering of water for microbial samples. Field probes were supplied to Larry Stetler for measurement of pH, Eh, conductivity and temperature of water seeps in Sanford Lab to begin documentation of the variability in geochemical parameters of interest to the microbial community. Cynthia Anderson committed her -80^{o}C freezer to temporary storage of microbial samples until a surface laboratory facility is constructed.

On the final day of the workshop, designs of the surface microbial laboratory and mobile underground laboratories, aka MULEs, were discussed with Steve Dangermond. A plan was proposed for characterization and photographic documentation of any water seeps on the 4850 level by Sanford Lab interns during this summer's fracture mapping by the RESPEC team. Kathy Hart discussed how this data would then be entered into the Vulcan database for Sanford Lab. A plan was also put forward for regular sampling of water being pumped from lower levels by collection and filtration of water in the 4500 hoist room collection tank. Finally, a plan was proposed for collection of cores, drilling water and possibly any fracture water during RESPEC coring of the Yates Formation at the 4850 this summer and how to isolate any of these boreholes from mine air if they weep water. All of these samples will be stored at Anderson laboratory. Anyone interested in obtaining samples, contact Cynthia Anderson. (CynthiaAnderson@bhsu.edu)

Fall DUSEL S4 Workshop

On October 1-3, Facility PIs and the DEDC will be holding a fall workshop for DUSEL science. The need for the meeting is based on the announcement of S4 awards, recent access to 4850L, and the need to coordinate the experimental program for the MREFC. The three-day meeting will take place at Lead, SD, and will be universally open to all, including S4 PIs and potential S5 proponents. The purpose will be to focus on the upcoming science program at DUSEL. In particular:

1. Foster and develop experimental programs at DUSEL.
2. Hear status updates from agencies, the facility, and from large cavern activities.
3. Understand the timeframe needed for deliverables for the MREFC.
    a. Allow S4 awardees, S5 proponents and others opportunity to meet.
    b. Search for commonalities that may influence the MREFC.
    c. Explore E&O interactions
4. Explore S5 possibilities
    a. Ideas beyond S4
    b. Longer term development
5. Explore locations for specific experiments utilizing the Vulcan database and go underground to site these experiments and to inspect the facility.

Please mark your calendars and also suggest topics for inclusion that would help in the successful development of the MREFC. You can contact Daniela Leitner and Tullis Onstott, Workshop co-chairs. tullis@Princeton.EDU, DLeitner@lbl.gov

Environment, Health & Safety

The EH&S advisory committee met on July 10 July in Lead.

DUSEL staff and SDSTA are taking 10 or 30 hour OSHA safety training courses. If you have any questions about this course, please contact your administrative or safety coordinators.

Cultural Outreach

On June 5, the Cultural Committee met at Sanford Lab. Daryl (KC) Russell, Director, SD Indian Health Care Initiative, Office of the Governor joined as a new member. The committee reviewed recommendations from the January Review, conclusions from John Glover's survey, and discussed the *Nature* article and its impact.

During the June 22 Sanford Lab dedication, members of the committee met with Rodney Bordeaux, the Rosebud Sioux Tribal President, Greg Young and Gabe Doney from the Rosebud Electronic Integration Corporation and Brandon Sazue, tribal Chairman of the Crow Creek Sioux.

Summer Safety

Avoid summer bug bites:

Don't use scented soaps, perfumes or hair sprays.

To remove a visible stinger from the skin, gently scrape it off horizontally with your fingernail.

Insect repellents can be effective against ticks and mosquitoes. Use just enough repellent to cover exposed skin and/or clothing.

NEW STAFF

Susan Von Stein has been selected as the new DUSEL EH&S Director effective immediately. Most recently Susan was EH&S Director for the SDSTA and she brings a detailed EH&S experience to the DUSEL Project. Her first task will be to develop a set of milestones for developing the DUSEL Integrated System Program for the PDR.

Ms. Wendy Zawada and Mr. Bryce Pietzyk, underground construction project engineers, joined DUSEL on July 6.

More information on these new employees in the August newsletter.

JOBS

DUSEL is seeking an Education & Outreach Director. Please refer to the ad at:
https://yourfuture.sdbor.edu/applicants/jsp/shared/frameset/Frameset.jsp?time=1248105129646

Two positions were advertised in June for a Geotechnical Design and Excavation Project Engineer and a Contracts Coordinator.

Requests for Proposals

Black Hills State University has released an RFP concerning Project Management for the Development of Programs, Exhibits, and Operations of the Sanford Center for Science Education. Applicants will be submitting proposals by August 7th. If a prospective applicant contacts you regarding this RFP, project scope, or any other issues related to development of the science education center, please do not address their questions. Instead, direct them to submit all questions to bensayler@bhsu.edu.

The DUSEL Project has released a request for proposals (RFP) for design and engineering services for the DUSEL underground laboratories. Contractors will be submitting their proposals to DUSEL by August 5th. If anyone should contact you regarding this RFP, project scope, or any other issues related to the DUSEL underground laboratory design work, please do not address their questions. Instead, direct them to submit all questions to the following email address: duselrfp@sanfordlab.org

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New address – We are still moving in …

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