

CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES

FOREIGN TRIP REPORT

SUBJECT Two week staff exchange at the National Institute of Advanced Industrial Science and Technology (AI 06002.01.292.601)

DATE/PLACE: October 29–November 11, 2005, Tsukuba and Hokkaido Island, Japan

AUTHORS: John A. Stamatakos

DISTRIBUTION:

CNWRA

W. Patrick
GED Directors
GED Managers
P. Maldonado
L. Gutierrez

NRC

J. Strosnider
M. Federline
W. Reamer
B. Meehan
V. Whipple
S. Cornell
D. DeMarco
E. Whitt
J. Dunn-Lee, OIP
L. Kokajko
E. Collins
J. Guttman
A. Campbell
T. McCartin
F. Brown
P. Justus
A.B. Ibrahim
B. Leslie
T. Ghosh
B. Hill

SwRI

Record Copy B, IQS

CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES

FOREIGN TRIP REPORT

Subject

Two week staff exchange at the National Institute of Advanced Industrial Science and Technology (AIST) in Tsukuba, Japan with site visits to the (1) underground test facility at Horonobe site in northern Hokkaido, Island; (2) Japan Atomic Energy Agency (JAEA) facility at the Tokai Research and Development Center in Tokai, Japan; and (3) Japan Nuclear Energy Safety (JNES) Organization offices in Tokyo.

Dates of Travel and Countries/Organizations Visited

October 29–30 , 2005: Travel to Tsukuba, Japan/AIST Offices
October 31–November 1, 2005: Horonobe Underground Test Facility Site, Horonobe, Japan
November 2–4, 2005: Geologic field trip of Hokkaido Island, Japan
November 5–7, 2005: AIST, Tsukuba, Japan
November 8, 2005: JNES Tokyo, Japan
November 9, 2005: JAEA, Tokai Research and Development Center, Tokai, Japan
November 10–11, 2005: AIST Tsukuba, Japan

Authors, Title, and Agency Affiliation

Dr. John A. Stamatakos, Manager, Geology and Geophysics, Center for Nuclear Waste Regulatory Analyses (CNWRA), San Antonio, Texas.

Background/Purpose

The CNWRA has a cooperative agreement with AIST to exchange technical information associated with the regulation of nuclear waste disposal. The AIST host in Japan was Dr. Tetsuichi Takagi, who recently completed a nine-month exchange at the CNWRA. Per the agreement between AIST and CNWRA, AIST paid travel costs associated with Dr. Stamatakos' trip to and from Japan. NRC paid for one week of Dr. Stamatakos' time while in Japan and the Southwest Research Institute paid for the other week.

The purpose of the foreign travel was to (1) visit the Horonobe Underground Test Facility site in Horonobe, Japan and understand the site in the context of the regional geology; (2) present CNWRA research on geology, tectonics, basin stratigraphy, and earthquake seismology; and (3) foster additional ties with AIST for future staff exchange.

Abstract: Summary of Pertinent Points/Issues

As described in the following sections, all the objectives of the travel were accomplished during the trip. Dr. Stamatakos visited the site of the Underground Test Facility in Horonobe, Japan and exchanged information on tectonics and deformation with researchers at that facility. Dr. Stamatakos also presented a series of seminars that summarized CNWRA research and led

subsequent discussions with AIST staff to improve AIST staff understanding of the CNWRA research program. In the coming year, Mr. Yasuo Tomishima will work at the CNWRA in San Antonio, Texas to learn about total system performance assessment.

The most interesting aspect of the visit was the unique approach Japan is taking in developing a nuclear waste program. The Japanese approach involves detailed site investigations of different geological site conditions (principally a comparison of granitic rock versus sedimentary strata) in order to develop the technical tools and review capabilities in advance of the site selection process. The primary objective of current technical activities in Japan is to assess the technical reliability of geologic disposal in the country. In October 2000, Japan established the Nuclear Waste Management Organization to implement geologic disposal in the country. Japan hopes to begin site selection and characterization, followed by infrastructure creation and site licensing within the next five years. Construction of a repository in granite or sedimentary rock is planned for the 2030s.

At Horonobe, the approach is to evaluate the subsurface conditions in fine-grained, deep-marine strata that have been uplifted by convergence between the Pacific and Asian tectonics plates. The proposed disposal method is to place vitrified waste enclosed in a thick metal container (overpack) in vertical holes below the water table and in a reducing environment. The vertical emplacement holes would then be backfilled with bentonite to buffer the waste packages from corrosion.

Discussion

After arriving in Japan, Dr. Stamatakos visited the Horonobe Underground Research Laboratory Project in northern Hokkaido. This is one of two underground research laboratories in Japan—the other facility is to be situated at Mizunami in central Japan. Both facilities are being developed to allow Japanese researchers to conduct systematic research on the geologic disposal of high level nuclear waste. The Horonobe test facility is being studied by the Japan Atomic Energy Agency (JAEA). Surface-based investigations at Horonobe are nearly complete and JAEA is preparing to construct the underground facility. While at the Horonobe site, Dr. Stamatakos was briefed by JAEA staff on the surface-based investigations. The briefings were followed by a field tour of the site, core laboratory, and nearby outcrops in order to observe the strata that will house the test facility. At Horonobe, Dr. Stamatakos also gave a seminar on the geologic record of basin development in the Yucca Mountain region of Nevada and California¹.

After the site visit to Horonobe, Dr. Takagi led a geologic field trip of Hokkaido Island. The field trip provided an overview of Hokkaido geology, including the Mesozoic crystalline metamorphic basement rocks, newly exposed subduction-related melanges and olistostromes, and a host of different types of silicic volcanic rocks. Dr. Takagi also led us to a unique groundwater aquifer system with effluent springs that has developed on the slopes of a large volcano. The highlight

¹ This presentation was the combination of two back-to-back presentations made by Dr. Stamatakos at the 32nd international Geologic Congress. The two talks were titled: Continental Basin Development in the Central Basin and Range Province Part I: *Stratigraphic Record of Basin and Range Extension in the Late Oligocene and Early Miocene in the Yucca Mountain Area, Nevada, USA* and *Continental Basin Development in the Central Basin and Range Province Part I: Stratigraphic Record of Basin and Range Extension in the Late Oligocene and Early Miocene in the Yucca Mountain, Nevada, USA*.

of the trip was a series of stops among the active volcanoes and associated hydrothermal features in southern Hokkaido.

During his second week in Japan, Dr. Stamatakos visited the AIST facilities in Tsukuba, north of Tokyo. Here, Dr. Stamatakos presented several lectures that included a repeat of his talk on the geologic record of basin development in the Yucca Mountain region of Nevada and California, as well as lectures on faulting studies at Yucca Mountain and recent CNWRA analog sand-box analog models of Crater Flat, Nevada². During the second week Dr. Stamatakos also visited the Japan Nuclear Energy Safety Organization (JNES) in Tokyo and the JAEA facilities at the Tokai Research and Development Center in Tokai, Japan. At both these sites, Dr. Stamatakos discussed CNWRA evaluation of the Yucca Mountain Surface Facility Area seismic site response³. Attachment A of this trip report provides a copy of contacts made during site visits in Japan. Attachment B of this trip report is a list of material handouts and other briefing material collected by Dr. Stamatakos during his trip. These are available upon request from Dr. Stamatakos.

Based on the site visits and discussions at the seminars, two general observations emerged. First, the nuclear waste program in Japan is immature relative to the U.S. program. In particular, the technical and programmatic roles of the various agencies and utilities involved in the program continue to evolve, and as a result, regulatory responsibilities are not yet established. For example, JAEA is currently positioned as a “neutral organization,” with a goal of developing and providing all the necessary technical information for site selection, site characterization, and site evaluation.

Second, many of the questions from the technical staff at the various agencies, especially at JNES, focused on the risk-informed and performance based regulatory approach implemented in 10 CFR Part 63. This can be interpreted to indicate that the Japanese program may be looking to implement a similar philosophy as it develops information necessary for site selection and site evaluation. For example, many of the questions centered on how the results of process-level models of ground water conditions at the Horonobe site can be abstracted and used in a system-level performance assessment.

Pending Actions/Planned Next Steps for NRC

CNWRA will host Yasuo Tomishima from AIST for a one year staff exchange. While at the CNWRA, Mr. Tomishima will obtain training related to U.S. regulations for deep geologic disposal of spent nuclear fuel and high-level waste, including requirements associated with site characterization and total system performance assessment. Mr. Tomishima will also interact with staff to evaluate geophysical investigations with respect to site characterization.

² The faulting talk was from the presentation given at the 2003 International High Level Nuclear Waste Management Conference titled *Methodologies for the Evaluation of Faulting at Yucca Mountain, Nevada*. The analog sand-box model talk was the same presentation given at the 2003 Geological Society of America Meeting in Seattle, Washington and titled *A Physical Analog Model of Extensional Deformation in the Yucca Mountain Region, Nevada*.

³ This talk was from the presentation at the 2005 Seismological Society of America meeting in Incline Village, Nevada and titled *Evaluation of Site Response for the Surface Facilities Area at the Potential Yucca Mountain Repository, Nevada*.

Points for Commission Consideration or Items of Interest

None

Attachments

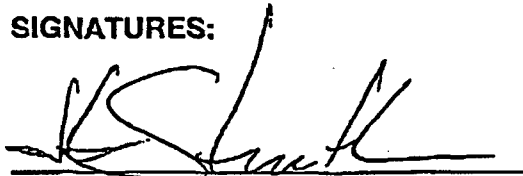
Attachment A—Business Cards of Contacts

Attachment B—List of Items

"On the Margins"

None

SIGNATURES:



John Stamatakis, Manager
Geology and Geophysics

12/14/05

Date

CONCURRENCE:



Gordon Wittmeyer, Assistant Director
Earth Sciences

12/14/2005

Date



Budhi Sagar, President
CNWRA

12/14/05

Date

ATTACHMENT A

Business Cards of Contacts

Koichiro Hatanaka



Deputy Group Leader, Sedimentary Environment Research Group
Horonobe Underground Research Unit
Geological Isolation Research and Development Directorate
Japan Atomic Energy Agency

Horonobe-cho, Teshio-gun, Hokkaido pref, 098-3207, JAPAN
TEL 01632-5-2022 FAX 01632-5-2344
E-Mail hatanaka.koichiro@jaea.go.jp
URL <http://www.jaea.go.jp>



幌延町 トナカイ

独立行政法人

日本原子力研究開発機構

地層処分研究開発部門 幌延深地層研究ユニット
堆積岩地質環境研究グループ

博士(工学)

研究員 操 上 広 志

〒098-3207 北海道天塩郡幌延町宮園町1番地8
TEL: 01632-5-2022 (代表)
FAX: 01632-5-2344
E-mail: kurikami.hiroshi@jaea.go.jp

原子力機構ホームページ <http://www.jaea.go.jp/>
皆様からの問い合わせ窓口 0120-140-405



SUZUKI Shunichi

Chief Researcher
Radioactive Waste Evaluation Office
Safety Standard Division

Incorporated Administrative Agency

Japan Nuclear Energy Safety Organization (JNES)

Fujita Kanko Toranomon Bldg., 3-17-1, Toranomon, Minato-ku, Tokyo, 105-0001
Tel: +81 (3) 4511-1794 Fax: +81 (3) 4511-1898
E-mail: suzuki-shunichi@jnes.go.jp URL <http://www.jnes.go.jp>

Recycled Paper



YAMASAKI Shinichi

Senior Officer & Senior Researcher
Radioactive Waste Evaluation Office
Safety Standard Division

Incorporated Administrative Agency

Japan Nuclear Energy Safety Organization (JNES)

3-17-1, Toranomon, Minato-ku, Tokyo, 105-0001
Tel: +81 (3) 4511-1801 Fax: +81 (3) 4511-1898
E-mail: yamasaki-shinichi@jnes.go.jp URL <http://www.jnes.go.jp>

Recycled Paper



KAWAKAMI Hiroto

Director & Senior Counselor
Radioactive Waste Evaluation Office
Safety Standard Division

Incorporated Administrative Agency

Japan Nuclear Energy Safety Organization (JNES)

Fujita Kanko Toranomon Bldg., 3-17-1, Toranomon, Minato-ku, Tokyo, 105-0001
Tel: +81 (3) 4511-1800 Fax: +81 (3) 4511-1898
E-mail: kawakami-hiroto@jnes.go.jp URL <http://www.jnes.go.jp>

Recycled Paper



KATO Masami

Director
System Reliability Evaluation Group/Radioactive Waste Evaluation Office
Safety Standard Division

Incorporated Administrative Agency

Japan Nuclear Energy Safety Organization (JNES)

3-17-1, Toranomon, Minato-ku, Tokyo, 105-0001
Tel: +81 (3) 4511-1790 Fax: +81 (3) 4511-1898
E-mail: kato-masami@jnes.go.jp URL <http://www.jnes.go.jp>

Recycled Paper



OTA Tetsuya

Senior Researcher
Structural Reliability Evaluation Group
Safety Standard Division

Incorporated Administrative Agency

Japan Nuclear Energy Safety Organization (JNES)

Fujita Kanko Toranomon Bldg., 3-17-1, Toranomon, Minato-ku, Tokyo, 105-0001
Tel: +81 (3) 4511-1823 Fax: +81 (3) 4511-1898
E-mail: ota-tetsuya@jnes.go.jp URL <http://www.jnes.go.jp>

Recycled Paper



SAITO Shigeyuki

Senior Officer & Senior Researcher
Radioactive Waste Evaluation Office
Safety Standard Division

Incorporated Administrative Agency

Japan Nuclear Energy Safety Organization (JNES)

3-17-1, Toranomon, Minato-ku, Tokyo, 105-0001
Tel: +81 (3) 4511-1811 Fax: +81 (3) 4511-1898
E-mail: saito-shigeyuki@jnes.go.jp URL <http://www.jnes.go.jp>

Recycled Paper



NATIONAL INSTITUTE OF
**ADVANCED INDUSTRIAL SCIENCE
AND TECHNOLOGY (AIST)**

Kazumasa ITO Ph. D.

Senior Research Scientist
Integrated Geology Team
Research Center for Deep Geological
Environments
1-1-1 Higashi, Tsukuba, Ibaraki 305-8567, JAPAN
TEL: +81-29-861-3977 FAX: +81-29-861-3643
E-MAIL: kazumasa-ito@aist.go.jp
URL: <http://www.aist.go.jp>



NATIONAL INSTITUTE OF
**ADVANCED INDUSTRIAL SCIENCE
AND TECHNOLOGY (AIST)**

Kenji SATAKE D. Sc.

Active Fault Research Center

1-1-1 Higashi, Tsukuba, Ibaraki 305-8567 Japan
TEL: +81-29-861-3640 FAX: +81-29-852-3461
E-MAIL: kenji.satake@aist.go.jp
URL: <http://www.aist.go.jp>



*National Institute of Advanced Industrial
Science and Technology (AIST), JAPAN*

Ming Zhang, Ph.D

Senior Researcher

Research Center for Deep
Geological Environments, AIST,
Higashi 1-1-1, Tsukuba, Ibaraki
305-8567, JAPAN

Phone: 81-29-861-3943
Fax: 81-29-861-3643
E-mail(O): m.zhang@aist.go.jp
E-mail(H): m.zhang@mail1.accsnet.ne.jp

DR. KAZUHARU TAKAHASHI

GEOLOGIST

Technical Development & Energy Section
Resources Development Dept.

NITTETSU MINING CO., LTD.

YUSEN BUILDING
3-2, MARUNOUCHI 2-CHOME, TEL. (03) 3216 - 5 2 8 5
CHIYODA-KU, TOKYO 100-8377, JAPAN FAX. (03) 3215 - 8 4 8 0
E - mail : takahashi-k@nmconsults.co.jp

JAPAN ATOMIC ENERGY AGENCY
Nuclear Safety Research Center
Waste Disposal and Decommissioning Safety Research Group
Principal Researcher

Tadao Tanaka, Ph D



Tokai, Ibaraki, JAPAN 319-1195
TEL 81-29-282-5625 FAX 81-29-282-6678
e-mail: tanaka.tadao26@jaea.go.jp

Mikazu YUI, PhD

Principal Senior Scientist

Unit Director, Geological Isolation Research Unit
Geological Isolation Research and Development Directorate
Japan Atomic Energy Agency (JAEA)

Tokai-mura, Naka-gun, Ibaraki-ken, 319-1194, JAPAN
TEL +81-29-287-3697 FAX +81-29-282-9295
E-Mail yui.mikazu@jaea.go.jp
URL <http://www.jaea.go.jp>

Atsushi Sawada

Performance Assessment Research Group
Geological Isolation Research Unit
Geological Isolation Research and Development Directorate
Japan Atomic Energy Agency

4-33 TOKAI-MURA, NAKA-GUN, IBARAKI, 319-1194, JAPAN
TEL 029-282-1111 FAX 029-282-9328
E-Mail sawada.atsushi@jaea.go.jp
URL <http://www.jaea.go.jp>

Shinichi NAKAYAMA, PhD

Group Leader, Principal Scientist

Waste Disposal & Decommissioning Safety Research Group
Nuclear Safety Research Center

Japan Atomic Energy Agency

Tokai, Naka, Ibaraki, 319-1195, JAPAN
TEL 81-29-282-6001 FAX 81-29-282-5934
E-Mail nakayama.shinichi@jaea.go.jp
URL <http://www.jaea.go.jp>

DOO-HYUN LIM, Ph.D.

International Fellow

Performance Assessment Research Group
Geological Isolation Research and Development Directorate

Japan Atomic Energy Agency

4-33 MURAMATSU, TOKAI, NAKA-GUN, IBARAKI-KEN, 319-1194, JAPAN
TEL 81-29-287-3695 FAX 81-29-282-9295
E-Mail: doo-hyun.lim@jaea.go.jp
E-Mail: doohyunlim@cal.berkeley.edu



Eiichi ISHII

Geotechnical Science and Engineering Group
Horonobe Underground Research Center

JAPAN NUCLEAR CYCLE DEVELOPMENT INSTITUTE

Miyazono-machi 1-8, Horonobe-cho
Hokkaido, Japan 098-3207
TEL : +81 1632-5-2022
FAX : +81 1632-5-2344
E-mail: ishii.eiichi@jnc.go.jp

JNC WEB SITE : <http://www.jnc.go.jp/>

Geology



Tatsuo FUKUSHIMA

Deputy Director

Horonobe Underground Research Center

JAPAN NUCLEAR CYCLE DEVELOPMENT INSTITUTE

Miyazono-machi 1-8, Horonobe-cho
Hokkaido, Japan 098-3207
PHONE : +81 1632-5-2022
FAX : +81 1632-5-2344
E-mail : dragon@tono.jnc.go.jp

JNC WEB SITE : <http://www.jnc.go.jp/>



幌延町 トナカイ

独立行政法人

日本原子力研究開発機構

地層処分研究開発部門 幌延深地層研究ユニット
堆積岩地質環境研究グループ

濱 克 宏

〒098-3207 北海道天塩郡幌延町宮園町1番地8
TEL : 01632-5-2022 (代表)
FAX : 01632-5-2344
E-mail : hama.katsuhiro@jaea.go.jp

原子力機構ホームページ <http://www.jaea.go.jp/>
皆様からのお問い合わせ窓口 0120-140-405

HP/Reclaim



幌延町 ブルーポピー

独立行政法人

日本原子力研究開発機構

地層処分研究開発部門 幌延深地層研究ユニット
堆積岩地質環境研究グループ

博士(理学)

高 橋 一 晴

〒098-3207 北海道天塩郡幌延町宮園町1番地8
TEL : 01632-5-2022 (代表)
FAX : 01632-5-2344
E-mail : takahashi.kazuharu@jaea.go.jp

原子力機構ホームページ <http://www.jaea.go.jp/>
皆様からのお問い合わせ窓口 0120-140-405

ATTACHMENT B

List of Items

**John Stamatakos—Japan Trip
October 2005**

List of Items

1. CD-ROM of JNC Report, covering the topics of the H17 project (JAEA Geological Isolation Research & Development Directorate)
2. International Conference on the Safety of Radioactive Waste Disposal, Tokyo, Japan October 3–7, 2005 (disk 1 & 2)
3. Digital Geological Maps of Japan 1:200,000, North Hokkaido 2003 (CD-ROM)
4. Digital Geological Maps of Japan 1:200,000, South Hokkaido 2003 (CD-ROM)
5. International Conference on the Safety of Radioactive Waste Disposal Program Tokyo, Japan October 3–7, 2005
6. Quantitative Assessment Radionuclide Migration Experimental Facility Folder (Japan Atomic Energy Agency)
7. ENTRY (Geological Isolation Basic Research Facility) Folder (Japan Atomic Energy Agency)
8. Development Center of Japan Atomic Energy Agency (November 8, 2005)
9. NUCEF (Nuclear Fuel Cycle Safety Engineering Research Facility) Folder (Japan Atomic Energy Research Institute)
10. Nature/Science Land Folder (One with the Earth Horonobe)
11. Folder in Japanese (Hydrogeological Characterization of Sedimentary Rocks with Numerical Inversion using Vertical Hydraulic Head Distribution)—An Application to Horonobe Site—2004
12. Introduction on JNES's Research Plan for the Regulation of HLW Geological Disposal in Japan Handout, November 2005 (JNES)
13. Introduction of Radioactive Waste Evaluation Office Handout, November 2005. Radioactive Waste Evaluation Office, Safety Standard Division (JNES)
14. Study of Formulating the Performance Index of Repositories Handout. Shunichi Suzuki, Chief Researcher, Safety Standard Division
15. New Organization Handout, Japan Atomic Energy Agency, JAEA Waste Disposal Research and Development, JAEA Waste Disposal Research Funding in Japan
16. An Overview - R&D activities of groundwater flow and transport models at ENTRY, JAEA Handout - Performance Assessment Research Group, Geological Isolation Research and Development Directorate
17. Research projects on hydrogeologic influence for safety assessment of high-level waste disposal Handout—M. Munakata, Waste disposal and decommissioning safety research group, Nuclear Safety Research Center, JAEA
18. Radioactive Waste Disposal Research in JAEA/NSRC Handout—Shinichi Nakayama, Waste Disposal & Decommissioning, Safety Research Group (NSRC) JAEA