

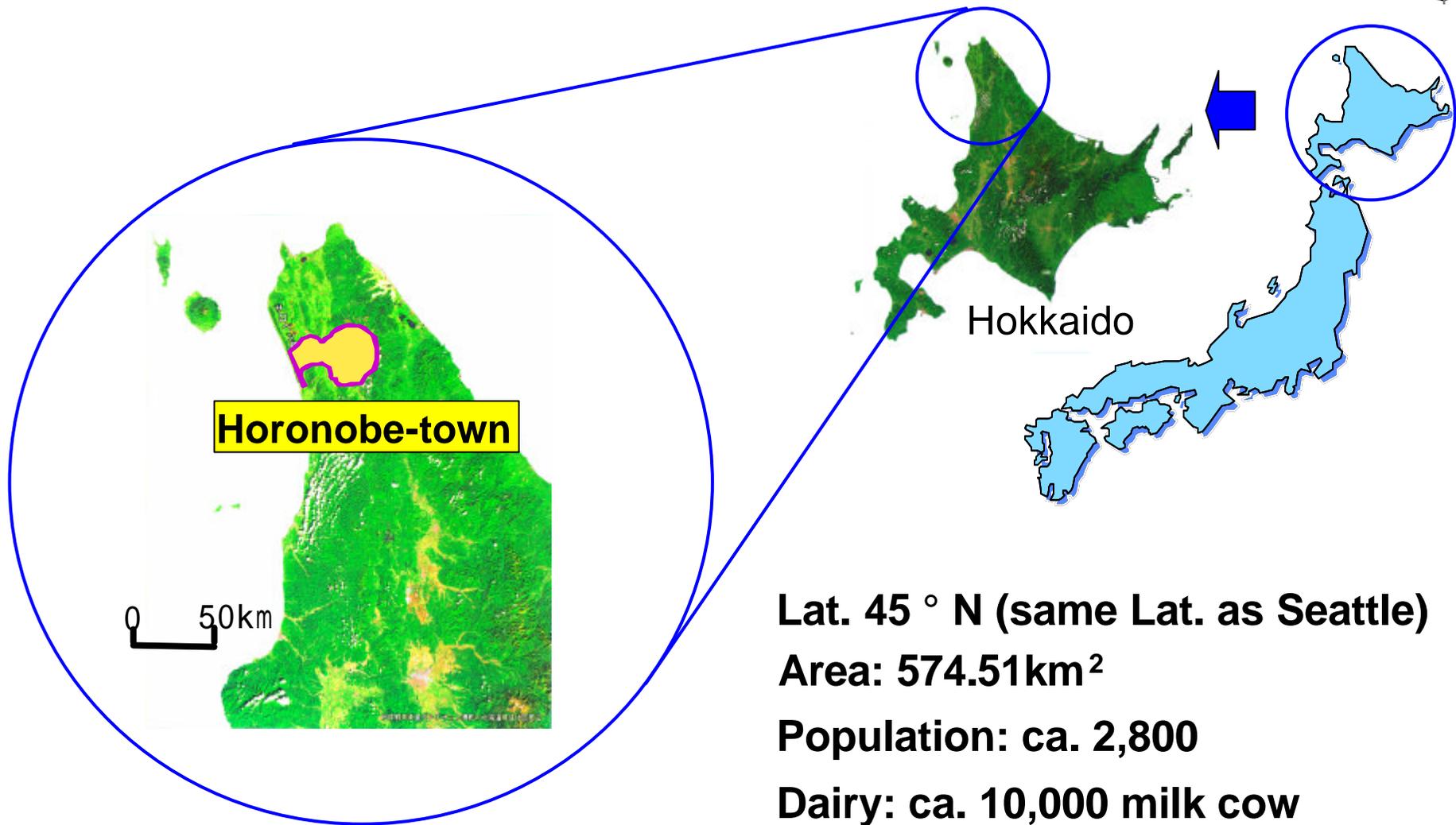
Underground Research Laboratory Program in Japan; Its Technical and Social Aspects

Japan Nuclear Cycle Development Institute
Horonobe Underground Research Center

Shinichi Yamasaki



Location of Horonobe-town



Lat. 45 ° N (same Lat. as Seattle)

Area: 574.51km²

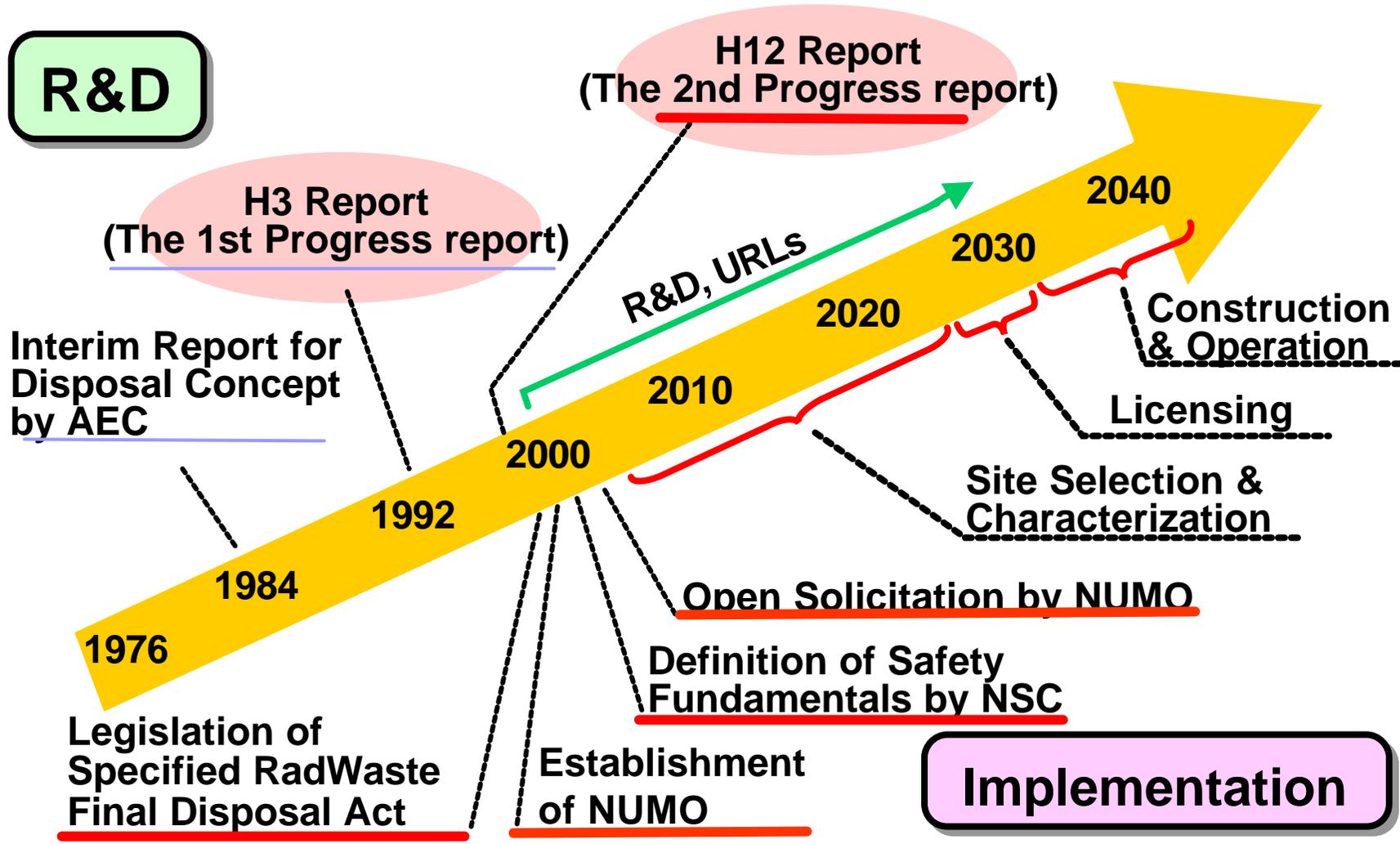
Population: ca. 2,800

Dairy: ca. 10,000 milk cow

Milestones of HLW Disposal Program in Japan



R&D

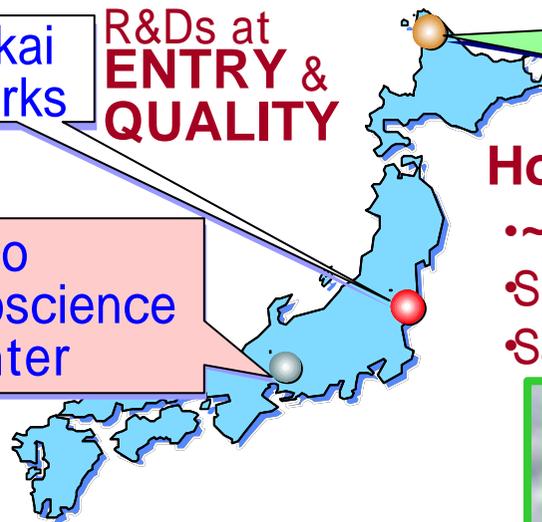


JNC's R & D facilities: Two off-site URLs and Tokai Works



Tokai Works R&Ds at **ENTRY & QUALITY**

Tono Geoscience Center



Horonobe Underground Research Center

Horonobe URL

- ~ 500m Depth
- Sedimentary rock
- Saline water



Mizunami URL

- ~ 1,000m Depth
- Crystalline rock
- Fresh water

Schedule (Fiscal Year)

2000	2010	2020
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Surface-based Investigation

Investigation during Excavation

Investigation in Drift

Schedule (Fiscal Year)

2000	2010	2020
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Surface-based Investigation

Investigation during Excavation

Investigation in Drift

Horonobe URL site



- *The preparation of the site was started in July, 2003*
- *The shaft sinking will be started in 2005*

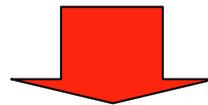


Basic understanding of the geological environment

Confirmation of applicability of the geological disposal technology

Investigation of the geological environment
Engineering technologies
Safety assessment

Promoting the public understanding to deep underground



Enhance the technical reliability of geological disposal

Outline of Horonobe URL Project



-Technical boundary conditions-

- Neogene argillaceous sedimentary formations, Koetoi and Wakkanai formations
- Less active, but young Omagari fault runs the Area
- Fairly active Neotectonic activities of the region: small earthquakes (swarms), up-lifting/subsiding
- The Area is located in potential oil/gas field
- Less rock strength, saline groundwater and dissolved methane
- Gentle topography possibly formed by periglacial phenomena

Outline of Horonobe URL Project



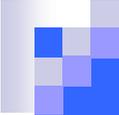
-Contents of Horonobe URL Project-

[Geoscientific study]

- 1) development of site characterization methodology
- 2) development of monitoring techniques
- 3) development of engineering techniques in deep underground
- 4) neotectonic characterization of the area

[Research and development (R&D) of technology for geological disposal (GD)]

- 5) development of engineering techniques for designing, construction and operation of a repository
- 6) development of safety assessment methodology



Project History

- Post-Project inauguration and Forthcoming Schedule -



- 2001.4: Horonobe Underground Research Center open
- 2001.6: Field investigation work started with heli-borne followed by two boreholes investigation
- 2002.7: Announcement of URL Area
- 2002.12: Announcement of URL construction site
- 2003.3: Acquisition of land for URL construction
- 2003.7: Ground-break ceremony and ground preparation (I) started
- 2004: Ground preparation (II) and surface buildings construction starts (completed in 2006)
- 2005: Surface-based investigation phase closes and construction phase initiates (Shaft base preparation)
- 2006: Shaft sinking starts
- 2010: Completion of underground facility, Operation phase starts

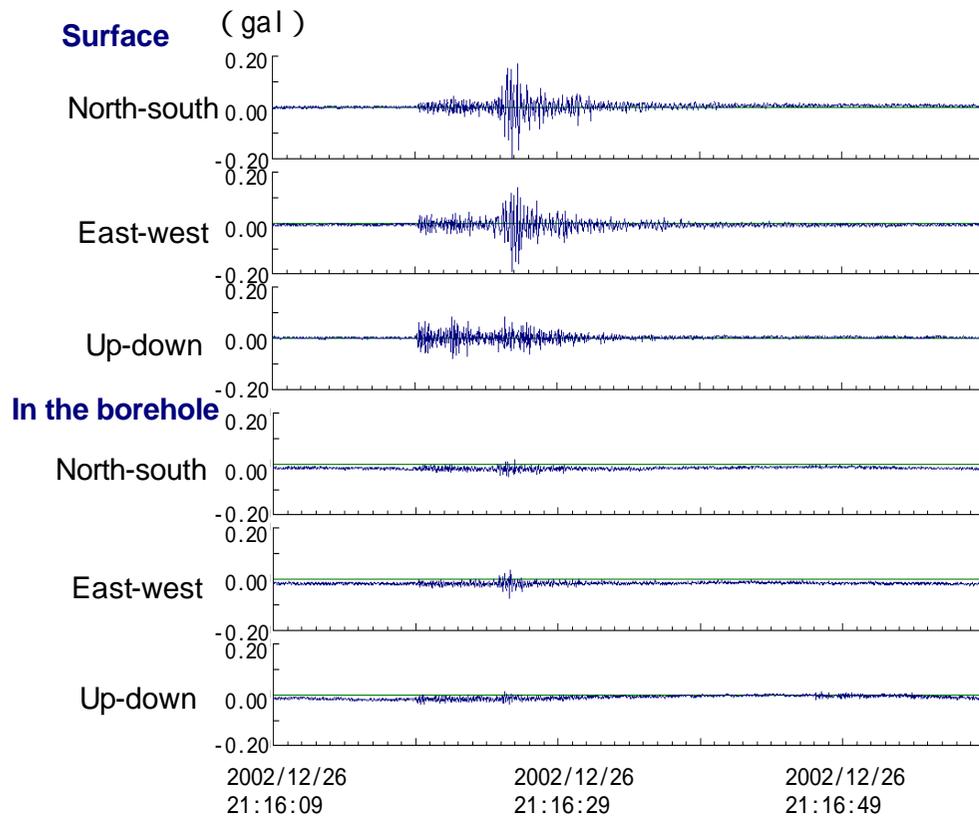
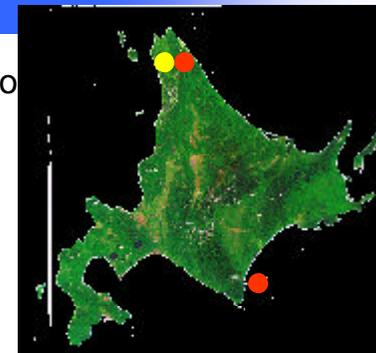
Geophysical investigations



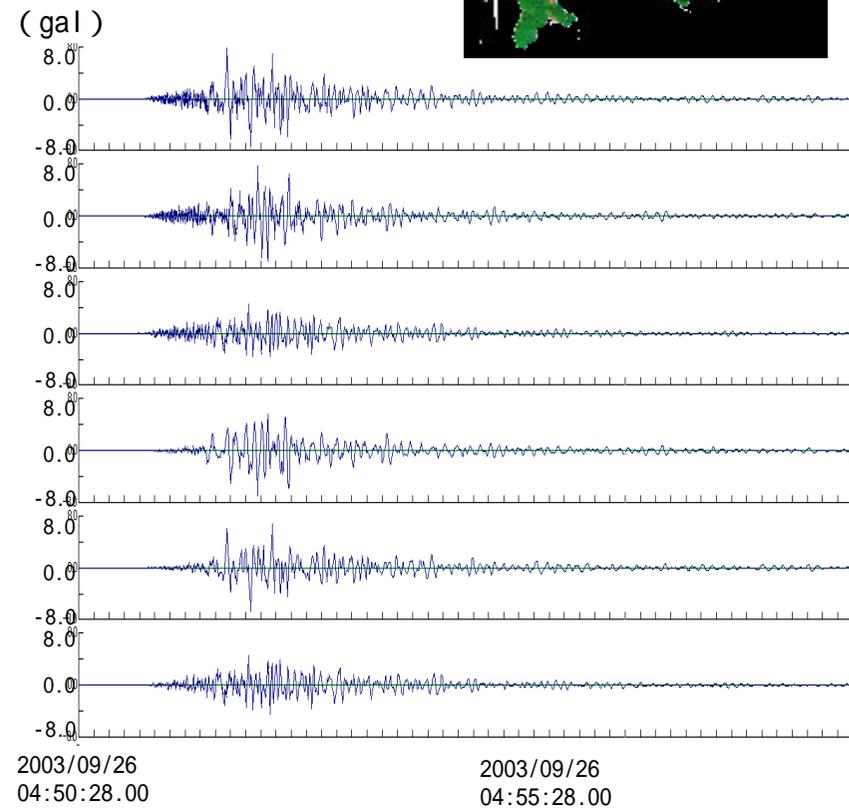
Air-borne survey



Earthquake Monitoring



Dec.26, 2002, Small earthquake occurred in neighboring town (Nakatonbetsu) M 2.8



Sep.26, 2003, Main shock of "2003 off-shore Tokachi earthquake" M 8.0

URL site selection (1)

-URL Area Selection-

[Requisites for Area]

- Host argillaceous formations and groundwater
- Rock mechanical strength
- Groundwater dissolved flammable gas content

- i) Extraction of candidate zones (2001)
- ii) First year's investigations (geophysical, geological and environmental investigation, 2001)
- iii) Selection of zones and places for borehole investigation
- iv) Two 720m deep borehole investigations (2001-2002)
- V) Existence of the host formation and groundwater, and provided actual rock mechanical and gas content data needed for examination of safe construction and operation.
- Vi) Confirmation of suitability of the zones for URL



URL site selection (2)



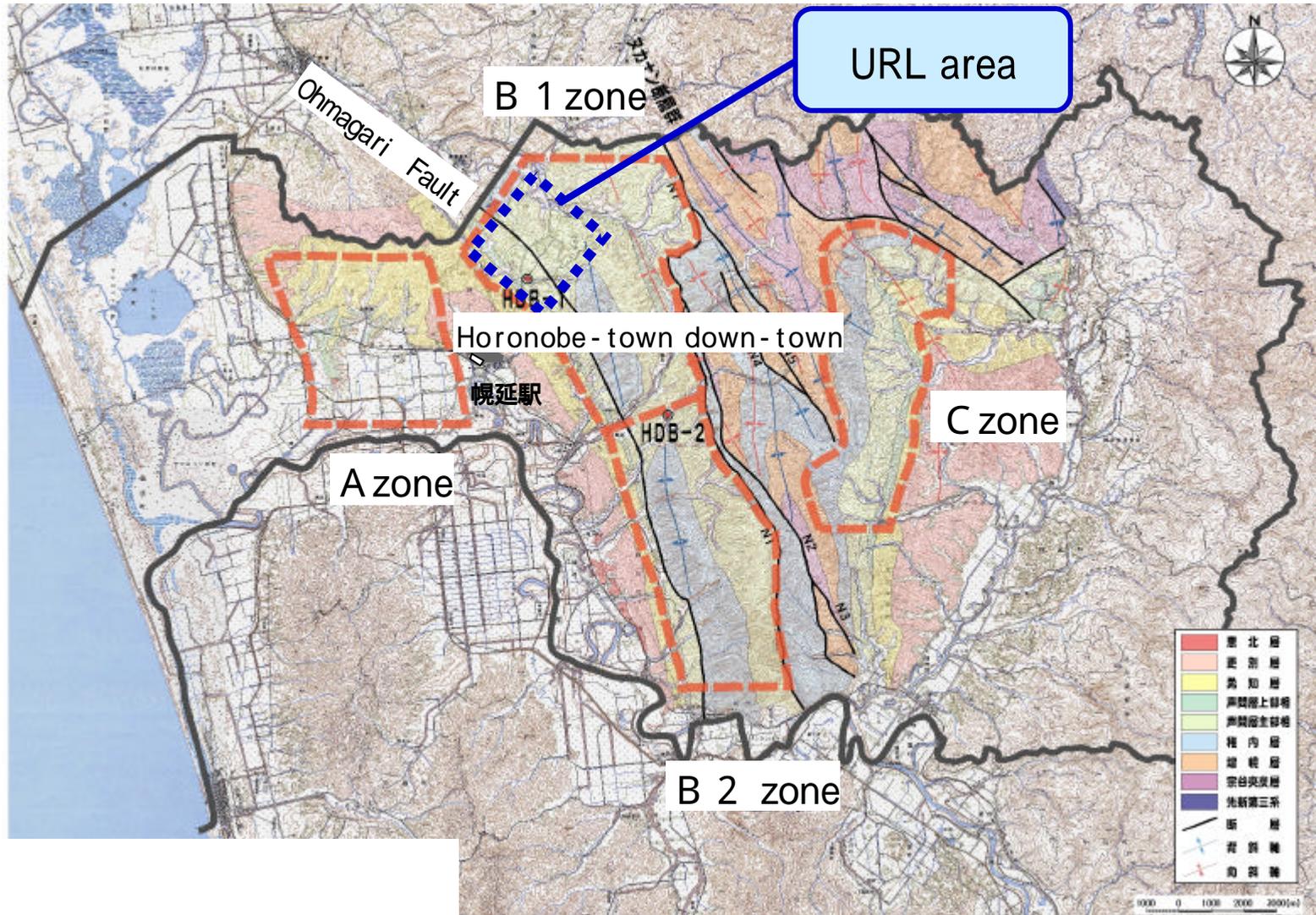
-URL Area Selection-

- vii) Selection of two candidate URL Area
- viii) Selection of URL Area “Hokushin”(announced in July, 2002)

-URL Site Selection-

19.1ha for URL construction (announced in December, 2002) and acquired in March, 2003.

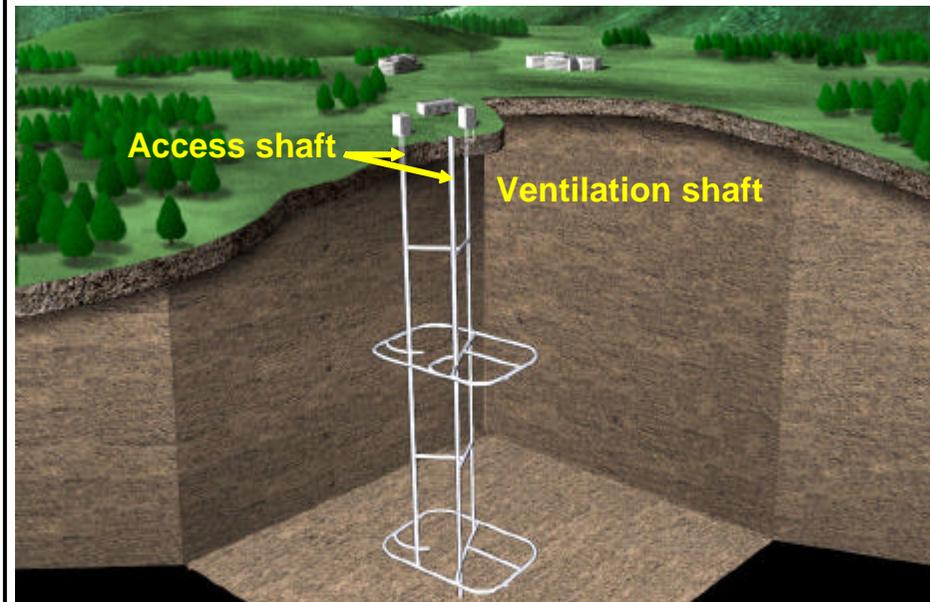
URL Construction Site



Layout for the URL



Three shafts
Distance between shafts: 70m (more than 3 times of shaft diameter)
Depth: 500m
Experimental drifts
Depth: 250m,500m
Length: long side 180m, short side 110m
total length 1,600m
Minimum radius: 30m (rail haulage)
Same direction as maximum principal stress
Connection drifts
Depth: 125m,375m
Total length: 200m



Access shaft: circular section, 6.5m
Ventilation shaft: circular section, 4.5m
Experimental drifts: Horseshoe-shaped section
inside width 4m

Outline of Horonobe URL Project



-Social boundary conditions-

- Some people are still suspicious of a real repository
- Environmental impact is the concern of the people as the region remains good natural environment and dairy farming as a basic industry
- Most land are used as grassland under agricultural land laws limiting non-agricultural use of lands
- The Area located up-stream of neighboring Toyotomi-town
- Toyotomi hot spring is located adjacent to the Area
- Hokkaido used to have many coal mines and experienced many severe mine accidents

Project History

- Pre-Project Inauguration -



1981: Horonobe-town has lured nuclear related facilities

1984: JNC announced Horonobe Storage Engineering Center(SEC) Plan
(SEC: Interim storage for vitrified HLW of JNC, a storage for LLW and a URL)

1985: JNC started field investigation work at candidate site
(1986-1987: A 1350m deep borehole investigation)

-The project had been suspended for more than 10 years-

1998.2: Withdrawal of SEC and a new proposal of the Horonobe URL project
by Science and Technology Agency (STA) made an application to

1998.12: JNC made an practical proposal of the URL project to Hokkaido and
Horonobe governments

-Examination of the application mainly by Hokkaido government-

2000.10: URL project was accepted

2000.11: Execution of an agreement by Hokkaido and Horonobe
governments

A Series of Institutional Framework Preventing being a Repository of HLW

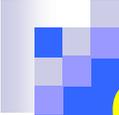


- (1) The Law (1998) for establishment of JNC
- (2) The Specified Radioactive Waste Final Disposal Act
- (3) The Long-term Program cited twice (1994, 2000)
- (4) Horonobe town ordinance in May 2000
- (5) Hokkaido ordinance in October 2000
- (6) The agreement among Hokkaido and Horonobe governments and JNC

Agreement among Hokkaido/Horonobe/JNC



- 1) JNC never bring nor use HLW in the area for the project,
- 2) JNC never lend nor transfer the URL facilities to the implementing entity, Nuclear Waste Management Organization of Japan (NUMO),
- 3) JNC will close the facility on ground and refill the URL,
- 4) JNC never have the area for the project be a repository for radioactive wastes nor introduce an interim storage of radioactive wastes in Horonobe.



Outline of Horonobe URL Project



-Idea of Horonobe URL Project-

Openness

- Open information, researches and facilities
- Assemble of the best minds: Involvement of Japanese and foreign organizations and researchers
- Offer of URL facilities to academic and industrial research use:

Cooperation with local community

Daily Public Relations (1)

-Public Relations-

[For Horonobe]

- Explanation on results and plan to the town
- Inserts on events and every field activities
- PR brochure inserted in newspaper
- Forum to explain result and plan to town people
- Participation in local events
- Individual farmer visit and talk

[For the neighboring town/village]

- Explanation on state-of-art of the project to the town/village
- PR brochure inserted in newspaper
- Radio advertisement
- Up-load and revise of information on Home Page
- Yearly science exhibition for kids

Daily Public Relations (2)

[For Hokkaido people]

- Explanation on results and plan to the town officials
- Advertisement for advance of the project on newspapers and magazines
- TV advertisement
- Forum to explain result and plan in Sapporo
(Questionnaire survey to ask Hokkaido people's recognition of Horonobe Project to assess efficiency of our PR measures)

-Open information-

- Allocate an open information corner in the office
- Lecture and offer of information to mass media
- Open any technical reports both in bookshelf in information corner and on home page
- Disclosure of research sites/activities and drilled cores
- On demand explanation and discussion on the project results and plan
- Answer to open questions

Daily Public Relations (3)

-Other activity-

- Environmental monitoring, fauna, flora, river water, noise and vibration

-Future plan for public relations-

- Open shafts and tunnels for experiencing deep underground circumstance and R&D activity
- Build an exhibition facility as an introduction to the underground

What we learned and learning?



- 0) Bad impression lasts long.
- 1) Town official's knowledge
- 2) Top-down requires bottom-up
- 3) Young people
- 4) Open heart, positive freedom of information and consistency
- 5) JNC as member of local community
- 6) Criticism from opposite
- 7) Internet << TV and newspaper
- 8) Daily safe, common and small activities.