NYE COUNTY NUCLEAR WASTE

REPOSITORY PROJECT OFFICE

WORK PLAN

TITLE: GASEOUS GEOCHEMICAL TESTING AND SAMPLING IN ONC#1	Revision: 1 Date: 3-16-98 Page: 2, 5 & 6 of 6
APPLICABILITY: Work Package No.: 3	SUPERSEDES:
APPROVAL Leslie W Bradshaw 3.17.98 Project Manager Date	CONCURRENCE J M Stuckless 3-19-98 On-Site Geotechnical Representative Date G. J. Nimz 3-19-98 Principal Investigator Date 3-25-98 Project Quality Assurance Officer Date

CHANGE NOTICE NO. 1

EFFECTIVE DATE: March 16, 1997

PURPOSE: To update background information section and information concerning the types of samples collected.

HOW TO FILE: Remove and replace existing pages 2, 5 and 6 in the workplan "Gaseous Geochemical Testing and Sampling in ONC#1", Revision 1, with the new pages 2, 5 and 6.

APPROVAL: J M Stuckless 3-19-98
On-Site Geotechnical Rep. Date

CONCURRENCE: 3-25-98
Quality Assurance Officer Date

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WORK PLAN

TITLE: Gaseous Geochemical Testing and Sampling in ONC#1	Revision: 1 Date: 10-20-97 Page: 1 of 6
APPLICABILITY: **Work Package No: 3**	**SUPERSEDES:**
APPROVAL Les W Bradshaw 02.19.98 **Project Manager** **Date**	**CONCURRENCE** 2-19-98 **On-Site Geotechnical Representative** **Date** 2-20-98 **Principal Investigator** **Date** 2/19/98 **Project Quality Assurance Officer** **Date**

1.0 INTRODUCTION

The intention of this work plan is to describe the purpose, background, and scope of the testing and sampling of gases which will occur at the ONC#1 borehole. It will encompass a description of the purposes of the testing, the history of investigations in and around the borehole, and provisions for the work involved in implementing the tests. This work plan will conclude that the testing and sampling at this site will support the planned investigations and the objectives of the NWRPO and will be accomplished in accordance with all quality controlled procedures.

2.0 PURPOSE

It is planned to obtain gas samples from ONC#1 and, analyze for a number of gaseous chemicals. The overall purpose of this geochemical analysis is to enable the evaluation of potential pneumatic pathways and unsaturated-zone pre-emplacement groundwater travel time.

Specifically the purpose of these tests will be to:

- Estimate the age of the gases in the vadose zone in ONC#1 and its relationship with the age of the water that could help in evaluation of recharge.
- Evaluate the dispersive nature of the gases in the vadose zone.
- Evaluate the effect of tunneling on the repository horizon.

3.0 BACKGROUND

The tunnel is a boundary condition for temperature, pressure, humidity, and environmental isotopes. Each of these parameters affect the unsaturated zone in various degrees depending on the properties of the host rock. Environmental chemicals such as fluorocarbons and isotopes such as ^{14}C ,^{13}C, Chlorinated Fluorocarbons (CFC), and ^{3}H are introduced by the tunnel as a constant source. These chemical species enter the unsaturated zone (UZ) with advection of the air as a result of the change in barometric pressure in the tunnel. They are transported in the UZ by the air through advective, dispersive, and diffusive processes. The background conditions for some of the chemicals have been established at the ONC#1. If the arrival of these environmental tracers in the ONC#1 can be detected, the dispersivities of the rock mass between the tunnel and ONC#1 can be calculated. The volume of rock affected by this test is the largest that can ever be tested at the site. Already, the responses to temperature and pressure are being recorded from which the pneumatic properties of the rock mass can be calculated. This data is extremely

important in future calculation of the transport of vapor and other gases in the repository horizon as a result of waste emplacement. Vapor transport analysis requires pneumatic and dispersive properties of the rock and this test can provide information about a large portion of the repository block.

Nye county has already installed the first instrumentation in the ESF for monitoring barometric pressure, temperature, and humidity. This has established a baseline for these parameters. Two areas need to be investigated. First, the chemical composition of the tunnel air needs to be established. The tunnel air is a mixture of the atmospheric air and the air that has been withdrawn from the surrounding rocks. Second, the variation of the chemical composition with time in the ONC#1 borehole needs to be monitored. Because chemical sampling and monitoring is expensive and difficult to perform, some preliminary modeling to estimate the number and frequency of the sampling is needed.

4.0 SCOPE OF WORK

4.1 Types of Planned Investigations

It is intended to obtain gas samples in ONC#1 using the Westbay's access tube that has been installed in the borehole.

4.2 Extent of Investigations

Sampling for all compounds should be performed at least once a year. Sampling for CFC's may need to be performed more frequently.

4.3 Location of Investigations

The gas sampling investigations will currently occur at borehole UE-25 ONC#1 with the Westbay/MOSDAX assembly. Sampling at other boreholes with the same instrumentation may occur in the future, but are not included in this work plan.

4.4 Schedule

In order to assure that the samples are not cross-contaminated by leaks along the access tube, a vacuum test was performed on September 30, 1996. Annual sampling for four years are currently planned.

4.5 Responsibilities of Investigators

All testing will be performed by personnel trained specifically with the instrumentation and applicable procedures. The NWRPO personnel shall carry Technical Procedure 9.40, the completion report prepared by Westbay for ONC#1, the manufacturer's manual for operation of the MOSDAX assembly, the open and close tool operations manual, and the flow meters calibration sheets. They shall follow the gas sampling procedure given in Technical Procedure 9.40. Additionally, it is the responsibility of the investigators to label each sample and fill out a chain-of-custody form to be shipped to the laboratory in a protective container within 48 hours of sampling.

4.6 Equipment and Calibration Requirements

The equipment used for this investigation includes the Westbay downhole instrument assembly, the MOSDAX assembly, and the gas sampling apparatus. The assembly has six valves. Valve 5 is a fine flow adjusting valve. The rest are shutoff valves and direct the flow of the gas. Tedlar bags are used for the sampling and are attached to the Tedlar bag vacuum purging and sampling chamber (TBVPS). Samples for CFC will be collected in special stainless steel cylinders which have passivated internal walls. The sampling tube for the CFC shall be stainless steel. A vacuum gage is attached to monitor the pressure in the tubing. The vacuum pump can be any suitable vacuum pump that can create a vacuum of more than 20 kpa.

Prior to any gas sampling, a vacuum test must be performed to test for any leaks in the downhole tubing string.

The procedure for the vacuum test is as follows:

1. After downloading the data, remove the MOSDAX assembly from the access tube.
2. Using sounding tape, tag for water level in the tube (if any).
3. Using the open/close tool open and close some of the valves.

4. Make sure all valves are closed before removing the tool.
5. Install the cap on the access tube and attach the nylon tube to the vacuum pump.
6. Pump until the vacuum gauge reaches a stable pressure. This may take up to an hour. Shut off the valve to the vacuum and observe the pressure gauge for one hour. Record the pressure every five minutes.
7. Repeat the test at least once.

The pressure data will be analyzed to evaluate the amount of leak from the access tube.

The next step in the investigation before sampling will be to purge the well bore sample zone. This involves opening a specified port and pumping until at least two borehole volumes have been evacuated. This process may take several hours. The Tritium, ^{14}C, and CFC samples are then ready to be taken.

4.7 Number and Types of Samples Collected

Presently, this work plan covers sampling of the ONC#1 well for Tritium, ^{14}C, and CFC gaseous chemicals. This procedure can be applied to future wells as well. The list of chemicals may be modified at the discretion of the PI.

The procedure for Tritium sampling involves attaching a tritium cylinder to the tubes near the proper valves in the assembly. The flow is then diverted into the cylinder. A minimum of one hour is required to complete this sampling.

CFC and ^{14}C sampling can begin once the system is purged of any atmospheric air that has entered the system. Tedlar sample bags are attached to the tubes and then inflated and deflated to purge outside air sources.

The sampling of gases can be repeated for as many intervals of interest as required; however, care must be taken to avoid contamination with the atmospheric air, and the process itself takes several hours to complete.

5.0 MANAGEMENT

To ensure that the work involved will be quality controlled and accomplished in accordance with the scope and objectives of the project, certain tasks must be performed. All individuals performing the investigations given in the above

sections shall be trained in procedures specifically applicable to the instrumentation used before conducting work and shall document that they have read and understand Technical Procedure 9.40. These individuals shall be referred to as NWRPO personnel. The project QA Officer shall be responsible for the coordination of the internal review of this work plan. They are also responsible for assuring the proper training of NWRPO personnel and verifying the compliance with the requirements of this plan. The PI shall be responsible for the preparation and modification of this work plan, as well as the oversight of the performance of the plan.