State of New Mexico

ENVIRONMENT DEPARTMENT

JUDITH M. ESPINOSA
SECRETARY

RON CURRY
DEPUTY SECRETARY

BRUCE KING
GOVERNOR

RECEIVED
JAN 30 1992
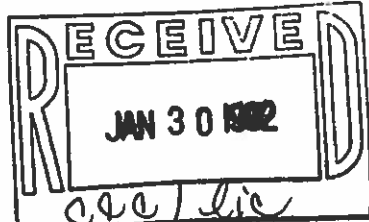
January 13, 1992

Mr. Patrick J. Higgins, Jr.
Experimental Programs & Waste Integration Branch
WIPP Project Integration Office
Department of Energy
P.O. Box 5400
Albuquerque, New Mexico 87185-5400

RE: Test Phase Experiments

Dear Mr. Higgins,

As you well know, the WIPP Test Phase includes a series of intensive investigations which will generate data needed to reduce uncertainties about WIPP operation. My recent participation in several meetings where WIPP Test Phase Experiments have been summarized as well as review of documents discussing strategies for the WIPP Test Phase has raised several questions, which I ask scientific curiosity. While I expect to answer many of these questions myself through review of test program plans, SNL research reports and other documents, this will occur over a relatively long period of time compared to the need which I currently have. I suspect that you may have the answers at your disposal in a more timely fashion than I and I request your help in answering these questions.

Although a series of tests are ongoing/planned that have an objective of quantifying microbial-mediated <u>gas generation</u> rates, there are several other areas of planned experimentation which likely should include the microbial component. To the extent that directly applicable information cannot be obtained from the literature, I feel that the importance of the interaction between microbes and waste or waste products warrants the inclusion of tests of that type at all levels of Test Phase experimentation.

My questions, primarily related to microbial interaction, are as follows:

GENERAL

(1) Will/have the biological, primarily microbial, component be characterized in the repository and in the repository environment?

(2) Will(has) information be(been) gained on the contribution of microbial action to radionuclide transport/retardation in the Culebra?

(3) Beyond evaluating microbial-mediated gas evolution, will(has) information be(been) gained on the effects of microbial action on gas migration through the Salado?

(4) Will/have studies of the dominant processes active in the undisturbed portion of the Salado Formation include biological processes?

SPECIFIC as keyed to "Strategy for the Waste Isolation Pilot Plant Test Phase"; Review Draft; April 1, 1991.

RE: "4.2.3 Studies of backfill consolidation and waste compaction", pg. 24:

(5a) Has/will the microbial content, by taxonomic classification and density, of any non-indigenous material (e.g. backfill additives) used in the repository be identified?

(5b) Has/will the specific contribution of microbes, by backfill type, to gas production/removal be determined?

(5c) Has/will the contribution of microbes, by backfill type, to chemical conditions in the repository be determined?

(5d) Has/will the possibility of introducing microbes that are not indigenous to the repository through backfill introductions been given consideration?

RE: "4.3.1 Laboratory tests", pg. 25

(6a) Have(will) the effects of waste compaction on gas generation by microbial mediation also been(be) considered?

(6b) Aside from the topic of microbial interaction, has consideration been made whether to consider water-retentive polymers as an alternative to bentonite clay or other backfill components? Polyacrylamide polymers have recently (mid-80's) been developed which exceed the water retentive properties of the clays by about a factor of two (double) and have lower hydraulic conductivities. I am aware of proposed research which compares new water retentive polymers to traditionally used clays in various areas of waste management technology.

RE: "4.3.2 Tests of leachability and solubility", pg. 26

(7) Naturally occurring microbes may influence the distribution of radionuclides in brines and solids in the repository. In their

2

attempts to genetically develop strains of radioactive-tolerant bacteria, researchers at INEL and elsewhere are compiling evidence that implies that bacteria in their native habitat can also adapt, over longer time periods, to elevated levels of radioactivity. If so, then the amass of research literature on microbial-induced metal leaching in relation to mill tailing and coal spoil reclamation needs be reviewed for incorporation of relevant data into the models predicting brine radionuclide concentrations and rates of accumulation. This is not to ignore the important precursor questions of (1) whether the densities and types of microbes necessary to have significant effects on leachability and solubility exist and (2) whether these conditions can develop through transport of anaerobic sub-surface microbes to repository depths.

RE: "4.3.3 Bin Tests" Pg. 26,27

(8a) Depending on confidence levels used, the number of bins tested for determining <u>statistically representative</u> rates and total potential production of gases can vary substantially. It is implied that the <u>variation</u> in gas-generation rates as measured in Phase 0 will be used to determine the sample size (bin replications) of test bins in subsequent test phases. What <u>confidence level</u> will be used in these computations of sample size?

(8b1) What type of CO_2 getters will be considered for use in Phase 2 tests?

(8b11) Will the getters be evaluated for variability performance?
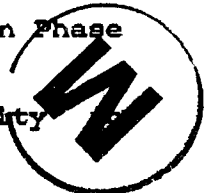
RE: "4.3.4 Alcove tests", pg. 28,29

(9a) "The alcoves will be used to verify that predictions from the smaller scale, more-selective laboratory and bin tests are satisfactory for the assessment of long-term performance". This is stated in bias terms giving the appearance that scientific objectivity is lacking going into the alcove tests. Was the statement meant to read "...be used <u>to determine whether or not</u> predictions from..."?

RE: Description of tests

You are probably aware of the problems with using terms which represent 100% certainty; e.g. "fully", "totally".

RE: "All drums will be fully vented through carbon filters designed to limit the emission of volatile organic compounds and to control particulate discharges while allowing gases to diffuse into the atmosphere of the alcove".

This statement is problematic in several regards. It implies that VOCs are not gases.

(9bi) How can drums be "fully" vented whilst limiting emission of VOCs?

If the filters are going to limit the emission of VOCs they must be activated.
(9bii) Are they activated to negative electrophoretic mobility or positive electrophoretic mobility and how is that accomplished?

(9biii) What is the strategy of limiting the emission of VOCs?

Studies by IT Corp. and Westinghouse show that the rate limiting factor for the diffusion of VOCs across "WIPP-supplied" carbon composite filters is concentration gradient, not filter, properties.

I may be incorrect, but I believe Paul Drez is on record at the August, 1991 NAS meeting as saying something to the effect that the manufacturer "has assured" DOE that the carbon composites are not activated.
(9biv) May I be so bothersome as to request to see the manufacturers data that supports this?

Since the information gained in these tests will be used, in part to justify full-scale repository operation, I hope you w recognize this questioning as scientific inquiry important to covering all bases of the WIPP Test Phase.

Lastly, it seems appropriate to have more than one life scientist serving on the NAS/NRC/BRWM Panel on WIPP. I empathize with the fact that the contribution of time to the Panel by its members is voluntary. However, I feel that the importance of the Panel in giving guidance to Sandia researchers on the direction of WIPP Test Program activities requires that the Panel have comprehensive expertise. For that matter it is important that the composition of DOE/SNL-WIPP research planning committees are collectively comprehensive as well.

Sincerely,

Gilbert J. Gonzales, Ph.D.
Bureau Chief, DOE Oversight

cc: T. Loughead, DOE/WPIO

4