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MEMORANDUM FOR: Hubert J. Miller, Chief  
 High-Level Waste Technical  
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 Division of Waste Management

WMHT Staff

BWIP Team

FROM: Michael J. Bell, Chief  
 High-Level Waste Licensing  
 Management Branch  
 Division of Waste Management

BWIP Team  
**WM-10**  
**PDR**  
 (Return to WM, 623-SS)

SUBJECT: PERFORMANCE ASSESSMENT'S ANALYTICAL CAPABILITIES AND  
 PROPOSED PLAN FOR ASSESSMENT PRIOR TO RECEIPT OF THE  
 SCR

The Performance Assessment Section (PAS) is available to help the Siting Section and the Design Section in their analyses of the BWIP site. After discussions with members of these sections and NRC's BWIP consultants, PAS has prepared this letter to focus ideas on the analyses which may be appropriate to review the SCR.

PAS modelling activities fall into three categories:

- Projects already completed,
- Planned projects which support the review of the performance assessment portion of the SCR, and
- Potential projects which could support the siting and design sections' SCR review activities.

Projects already completed include:

Analysis of RHO boundary conditions

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*"Re-decisional in Nature"*

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Partial analysis of PNL boundary conditions

Sensitivity of flow to hydrostratigraphic unit selection

Partial sensitivity of flow to boundary conditions

Planned projects derive from the two criteria in 10CFR60 that the EPA standard shall be met, and that groundwater travel time from the disturbed zone to the accessible environment shall be at least 1000 years. The projects are intended to help guide the DOE site characterization program at Hanford so it will provide the information necessary for the NRC to reach findings on these criteria.

In the review of the Performance Assessment Sections of the SCR, Geotrans, Inc., under Task 7 in contract B-6985 will analyze the four scenarios anticipated in the SCR.

Scenario Analyses (RRL Scale)

- 1. Four Scenarios known to be included in the SCR.
  - A. fault through or near repository
  - B. base case
  - C. earthquake swarms
  - D. undetected permeable aquifer beneath the repository
- 2. Other scenarios not proposed elsewhere and decided upon by the NRC staff as required.

Sandia consultant, Mark Reeves, under an existing RES contract, FIN A-12-66, "Development of Risk Assessment Methodology in Alternate Media," could perform the following analyses:

- 1. Regional Scale model of the Columbia Plateau, in order to determine a range of boundary conditions for the Pasco Basin Scale model.
- 2. Sensitivity Analyses of Regional Model.
  - A. Boundary conditions effect on regional flow patterns
  - B.  $K_v/K_h$  ratio effect of regional flow patterns

Additionally, Linda Lehman, on a technical assistance contract could pick up the following analyses:

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1. Pumping Scenario

- A. With a fault at the river
- B. No fault at the river

This is intended to answer questions regarding the effect of pumping on the hydraulic gradient across the repository and also to assess the effects on the definition of accessible environment.

2. Effects of large scale impoundment, lakes or dams on the flow path from the repository.

The following projects have been suggested as potentially helpful to the siting and design sections in their reviews of the Hanford SCR, based on discussions during Hanford Review Team meetings. Please review them and note those which will be of aid, and suggest others which you consider useful. In your review, please bear in mind that these projects may require diversion of performance assessment resources from other activities such as initial modelling of the welded tuff and salt sites or early review of the performance assessment chapters of the Hanford SCR. Therefore please limit your endorsement to those projects which provide information which is clearly needed by the siting or design sections for review of the Hanford SCR and which cannot be obtained by another simpler way, such as expert judgement.

Work Proposed To Be Done In-House

- 1. Modify existing 3-D SWIFT grid to reflect the proposed Columbia Fault. This will give us two Pasco Basin grids, one with a fault and one without.
- 2. Perform sensitivity analyses using both grids:
  - A. Vary  $K_v/K_h$  ratio:
    - 1. over entire Pasco Basin
    - 2. under anticline structures
    - 3. under the river

This will determine effect of permeability ratio on flowpath and discharge points.

B. Vary Boundary Conditions

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1. effect on flow path
2. what is required to force water to discharge at the Columbia River?
3. what is required to force water to discharge at Wallula Gap?

\*\* Decision on most probable flow lines required before going to one or two dimensions. One or two dimensional models must be along a stream line.

3. Set up NWFT/DVM grid using pressure boundary conditions from Pasco Basin or Regional Scale models. (2-D RRL scale - dependent upon flow path selection, will probably include discharge point).
4. Sensitivity Analyses (2-D grid) to travel time parameters.
  - A.  $K_h$
  - B.  $K_y$
  - C. porosity
  - D. storativity

Work which could be contracted in an existing contract (FIN B-6985 Task 7) with Geotrans, Inc., could perform the following analyses:

Well Testing (Local Scale)

- A. Detailed pumping tests to determine units which need extensive field testing for determination of critical parameters.
- B. Well spacing within clusters to maximize data recovery.
- C. Sensitivity of above tests to variation in  $K_y, K_h, K_v/K_p,$  porosity, storativity and other parameters which may affect test results.

Acres American, again under Task 7 of the Benchmark Contract could pick up the analyses which involve shaft location, number or degradation as follows:

1. Analysis of shaft placement and numbers of shafts (RRL Scale).

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- a. flow field effects
  - b. creation of U tubes
2. Sensitivity of shaft permeability to imposed stresses such as:
    - a. increased pumping above the repository
    - b. heat pulse
    - c. gradient changes in flow field
    - d. rock damage during shaft sinking
    - e. other
  3. Impact of Shaft Seal degradation of failure (RRL Scale or Pasco Basin Scale).
  4. Other design or shaft scenarios requested by Design or Siting sections.

Even with contractor support, several large areas of modeling have not been included. This is mainly due to the limited understanding of the bulk of the parameters needed for such an analysis at this time. It is probable that these analyses would be done sometime between the SCR submittal and the construction authorization. This work plan therefore does not include the following:

1. Radionuclide transport modeling.
2. Sensitivity analyses of transport parameters such as  $K_d$ , dispersivity, leach rate and solubility.
3. Sensitivity of hydrostratigraphic units for transport modeling.
4. Effect of heat from the repository on flow parameters.
5. Thermal mechanical effects on flow properties.

During Plan development, staffing constraints and areas of expertise were considered. Implicit in this estimate is that one person (Ellen Quinn) will be available half time and one or two other persons, (Stewart

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Silling and Peter Ornstein) will be available for small portions of time. It is therefore necessary to rely on ongoing contracts to provide the resources required for a thorough and timely analyses.

Your prompt response would be appreciated.

Michael J. Bell, Chief  
High-Level Waste Licensing  
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