NUCLEAR WASTE CONSULTANTS INC.
8341 So. Sangre de Cristo Rd., Suite 14
Littleton, Colorado 80127
(303) 973-7495

WM-RES
WM Record File
D1021
NWCI

WM Project 10,11,16
Docket No.
X PDR ✓
LPDR B,H,S

'86 DEC 29 A11 :49

X Distribution:
Pohle

December 22, 1986

009/2.3/TTI.011
RS-NMS-85-009
Communication No. 121

U.S. Nuclear Regulatory Commission
Division of Waste Management
Geotechnical Branch
MS 623-SS
Washington, DC 20555

Attention: **Mr. Jeff Pohle, Project Officer**
Technical Assistance in Hydrogeology - Project B (RS-NMS-85-009)

Re: **Trip Report - Creston and BWIP Hydrology Data Review, December 1-5, 1986**

Dear Mr. Pohle:

This letter serves as the Nuclear Waste Consultants (NWC)/Terra Therma Inc. (TTI) trip report for the NRC Staff/Contractor review meeting at In Situ Inc.'s Creston Site (December 1, 1986) and the BWIP Hydrology Data Review held at Richland, Washington, on December 2-5, 1986. Nuclear Waste Consultants was represented by Mr. Adrian Brown; Terra Therma was represented by Mssrs. Mike Galloway and Fred Marinelli, as requested by the NRC Project Officer. NWC considers that this meeting and the work that is anticipated to flow from it are accountable under Subtask 2.3 of the current contract.

The purpose of the Creston visit was to observe and offer initial responses to the In Situ Inc. research work on hydrology of fractured basalt. Simultaneously with the Creston visit, staff and contractor personnel visted the University of Idaho research facility at ther Bunker Hill Mine, Kellogg, Idaho.

The purpose of the data review was primarily to become familiar with recent data that has been collected by DOE; a secondary purpose of the meeting was to review the quality of selected portions of the BWIP data base.

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Members of the NWC/TTI team provided input to the NRC Site Leads and other designated NRC Staff during both the field trips and during the data review. In addition to the summary NRC meeting notes which are attached to the trip report, NWC notes that detailed comments from the team members on specific pieces of data that were reviewed are already part of the NRC's total documentation of this DOE/NRC interaction.

If you have any questions about this trip report, please contact me immediately.

Respectfully submitted,
NUCLEAR WASTE CONSULTANTS, INC.

Mark J. Logsdon

Mark J. Logsdon, Project Manager

Att: Trip Report on Creston and BWIP Hydrology Data Review, December 1-5, 1986

cc: US NRC - Director, NMSS (ATTN PSB)
DWM (ATTN Division Director)
Mary Little, Contract Administrator
WMGT (ATTN Branch Chief)

cc: M. Galloway, TTI
L. Davis, WWL
J. Minier, DBS

U.S NUCLEAR REGULATORY COMMISSION
OFFICE OF RESOURCE MANAGEMENT

TRIP REPORT
CRESTON AND BWIP HYDROLOGY DATA REVIEW
RICHLAND, WASHINGTON
DECEMBER 1-5, 1986

TECHNICAL ASSISTANCE IN HYDROGEOLOGY
PROJECT B - ANALYSIS
RS-NMS-85-009

December 22, 1986

TERRA THERMA, INC.

WATER CONSULTANTS AND ENGINEERS

8341 S. Sangre de Cristo Rd., Suite 14, Littleton, CO 80127 (303) 973-7492

December 9, 1986

Nuclear Waste Consultants
8341 S. Sangre de Cristo Road
Littleton, Colorado 80127

Att: Mark Logsdon, Project Manager

Re: Trip Report - Creston and Richland, Washington

Dear Mr. Logsdon:

This letter reports on Terra Therma's recent trip to Creston and Richland, Washington in support of the NRC's BWIP activities.

Adrian Brown, Fred Marinelli, and Michael Galloway were requested by the NRC to visit the Creston Site on Monday, December 1, 1986. The Terra Therma (TTI) team members arrived in Spokane, Washington early (3 a.m.) on December 1, 1986. We met with several members of the NRC, In-Situ personnel, Paul Davis of Sandia National Labs, Roy Williams and Associates personnel, and representatives of various affected Indian tribes and states. In-Situ provided a brief introduction to their research project and answered questions regarding various technical points.

At approximately 10 a.m., the attendees split into to two groups, one leaving for Creston with In-Situ and the other leaving for a research mine in Kellogg, Idaho. Adrian Brown visited the mine while the other two TTI team members visited Creston.

In-Situ personnel directed the tour of the research site at Creston, including a brief description of the geology, visit to several well sites, and inspection of well monitoring equipment. Much of the discussion centered on hydrologic conditions encountered during drilling and their implications to head relationships on the site. In-Situ is in the processes of preparing a test plan which will be submitted early next year, but the test plan was not discussed during the site visit.

The second group visited a hard-rock mine near Kellogg, Idaho which is being used in the research of fracture-flow hydrology by the University of Idaho. During the visit, the attendees were shown several examples of on-going research projects, including a flow-test of fractured rock adjacent to known geologic structures. Several pieces of equipment used by the researchers for monitoring were observed.

On Tuesday, December 2, 1986, NRC, DOE, TTI, RWA, Sandia, the States, and Affected Indian tribes (See Attachment 1 for full attendance list) met in Richland for the Data Review. After brief introductions, data was provided by DOE for review. The Data Review continued through Thursday, December 4, 1986, at which time the NRC and its contractors prepared a summary of the Data Review. Thursday night, NRC personnel completed the summary and attached the Data Checklists which had been completed by the reviewers during the week of review (Attachment 2 (Summary only)). The document was then submitted to DOE on Friday morning for review and comment. The review was adjourned at about 10 a.m. on Friday, December 5, 1986.

If we can provide any additional information or clarification, please do not hesitate to call us.

Sincerely,
TERRA THERMA, INC.

Michael Galloway
Project Manager

Attachments

	Name	Affiliation
*	A. Brown	Nuclear Waste Consultants/ Nuclear Regulatory Commission
*	M. Galloway	Nuclear Waste Consultants/ Nuclear Regulatory Commission
*	F. Marinelli	Nuclear Waste Consultants/ Nuclear Regulatory Commission
*	G. K. Jacobs	Oak Ridge National Laboratory/ Nuclear Regulatory Commission
**	R. Patt	Oregon Water Resources Departmen
	R. W. Bryce	Rockwell Hanford Operations
	R. M. Carter	Rockwell Hanford Operations/Lega
	J. Fassett	Rockwell Hanford Operations/ Geoscience
	K. A. Hadley	Rockwell Hanford Operations/ Licensing
	S. H. Hall	Rockwell Hanford Operations/ Hydrochemistry Unit
	D. J. Halko	Rockwell Hanford Operations
	B. Hiergesell	Rockwell Hanford Operations
	L. B. Nelson	Rockwell Hanford Operations
	R. Stone	Rockwell Hanford Operations/ Basalt Waste Isolation Project
	S. R. Strait	Rockwell Hanford Operations/ Basalt Waste Isolation Project
*	P. Davis	Sandia Labs/Nuclear Regulatory Commission
**	J. Stohr	State Department of Ecology
**	C. L. Calkins	Umatilla Tribe
*	D. Ralston	Williams and Associates/Nuclear Regulatory Commission
*	R. E. Williams	Williams and Associates Inc./ Nuclear Regulatory Commission
*	G. Winter	Williams and Associates/Nuclear Regulatory Commission
	J. Wittman	Yakima Indian Nation

* NRC Participants

** States/Indian Tribes Participants

Attachment No. 1

Nuclear Regulatory Commission
Department of Energy
Basalt Waste Isolation Project
Hydrology Data Review

December 2-4, 1986

	Name	Affiliation	
	O. O. Thompson	Department of Energy-Headquarters Licensing	
	D. H. Dahlem	Department of Energy-Richland Operations Office/Basalt Waste Isolation Division	
	D. Marjaniomi	Department of Energy-Richland Operations Office/Basalt Waste Isolation Division	
	K. M. Thompson	Department of Energy-Richland Operations Office	
**	A. Alkezweeny	Council of Energy Resource Tribes/Tribal Onsite Representativ	
**	S. Hart	Council of Energy Resource Tribes (Nez Perce, Umatilla)	
**	A. Djerrari	Earth Water Air (Yakima Indian Nation)	
**	V. Nguyen	Earth Water Air (Yakima Indian Nation)	
**	F. K. Kugzruk	Nez Perce Tribal Representative	
*	D. L. Chery	Nuclear Regulatory Commission	
*	N. Coleman	Nuclear Regulatory Commission/ Waste Management	
*	F. R. Cook	Nuclear Regulatory Commission	
*	P. Hildenbrand	Nuclear Regulatory Commission/ Waste Management Repository Projects Branch	
*	H. Lefevre	Nuclear Regulatory Commission/ Nuclear Materials Safety and Safeguards	
*	T. Verma	Nuclear Regulatory Commission/ Waste Management Geotechnical Branch	
*	M. F. Weber	Nuclear Regulatory Commission/ Waste Management Geotechnical Branch	

* NRC Participants
** States/Indian Tribes Participant

SUMMARY NOTES FOR BWIP HYDROLOGY DATA REVIEW

December 2-4, 1986

1.0 BACKGROUND

U. S. Nuclear Regulatory Commission (NRC) staff and their Technical Assistance contractors working on the Basalt Waste Isolation Project (BWIP) conducted a review of hydrologic data for the BWIP site on December 2 through 4, 1986. U. S. Department of Energy, Basalt Waste Isolation Division (DOE) made the requested data (Attachment 1) available to NRC at the Rivershore Inn located at Richland, Washington. Representatives of the Yakima, Nez Perce and Umatilla Indian Nations, and the States of Oregon and Washington also participated in the review of available hydrologic data. Attachment 2 contains the list of participants.

2.0 OBJECTIVES

1. To become familiar with types and quality of data being collected, data collection techniques and procedures, and documentation of data.

2. To gain an understanding of how and where the data are being collected and documented.

3. To the extent practicable, to identify and obtain data to be evaluated by the NRC review team at a later date.

4. To review hydrologic data from the Hanford Site in preparation for the upcoming DOE/NRC meeting about the BWIP hydrologic testing strategy.

5. To examine the application of BWIP's data collection, documentation and quality assurance procedures used between January 1984 and the present.

3.0 REVIEW ACTIVITIES

The BWIP hydrologic data made available by DOE (Attachment 3) was examined by five review teams consisting of NRC staff and their contractors (Attachment 4). Representatives of the States and affected Indian Nations were also invited to join these teams in the area of their interest and/or expertise. Review sheets

(Attachment 5) were used to document review comments by the review teams. These comments are of a preliminary nature and subject to change after further review by the NRC staff.

A request was made to DOE in the afternoon of December 3, 1986 to allow the NRC staff and contractors to continue reviewing data after 5:00 P. M. This request was denied by DOE.

3.1 NRC OBSERVATIONS

The NRC general observations are given below. More specific observations made by the review teams are included in the review sheets (Attachment 5).

3.1.1 INFORMATION REQUESTS

Requests for additional information were made to DOE to clarify information evaluated during the review. These information requests were made on "Forms" provided by DOE (Attachment 6). Only about a third of these requests were responded to by DOE during the course of the data review.

3.1.2 HYDROLOGIC TESTING

The hydrologic testing information reviewed consisted primarily of data from holes DC-23GR and DC-18 and hydrologic field test procedures. Information from the field controlled notebook and the data book for DC-23GR form a relatively complete record of the data and decisions involved in the testing program. However, the quality of information recorded in the field-controlled notebook is inconsistent because several different field hydrologists recorded the information for this well. A field controlled notebook was not available to compare with the data book for DC-18 for our review despite frequent requests.

Problems identified during this portion of the hydrologic data review are discussed below under three headings: procedures, data collection, and data presentation. In addition, a brief discussion is presented concerning the implications of the data review analysis with respect to LHS testing.

PROCEDURES: The Hydrologic Field Testing Procedures (BOP C-2.8) do not provide guidance for multiple well testing or data analysis. Procedures for identification of hydrologically similar intervals for observation, selection of locations of observation sites at varying horizontal distances and locations of observation sites in overlying or underlying flow tops or interiors are not specified.

The procedures presented in BOP C-2.8 do not provide guidance for analysis of test results other than quotation of example references for analytical models. The procedures do not address the following questions:

- Which analytical models should be used for data analysis?
- How are observed deviations of data from ideal responses analyzed?
- How are hydrologic coefficients selected from a suite of values calculated using alternative analytical models?

In addition, BOP (C-2.8) does not address the placement of transducers up-hole or down-hole for measurement of pressures during hydrologic tests. Problems associated with transducer placement are discussed in the following sections about data collection.

DATA COLLECTION: Problems in data collection identified during the review may be grouped under three general categories: up-hole versus down-hole transducers, data handling failures, and failure to optimize testing opportunities. Previous NRC data reviews identified problems with interpreting test results based on up-hole placement of transducers. Data reviewed during this data review illustrate the problems associated with the lack of specification of transducer placement. Hydrologic testing in DC-23GR used a combination of downhole and up-hole transducer placement. However, testing in DC-18 was performed with up-hole transducer placement for all long-term constant discharge tests and for all tests below about 1000 feet. The lack of consistency in transducer placement between concurrently tested holes introduces uncertainty in comparison of testing results. In addition, interpretation of testing results from DC-18 may be difficult because of problems inherent in using up-hole transducers or water level measurements. For example, constant discharge test data from the Rosalia flow in DC-18 will be difficult to interpret because of inconsistencies in drawdown/recovery data resulting from uphole transducer placement.

Experience at DC-23GR suggests that field data handling systems are subject to frequent failures. Failures have been observed to occur in pressure transducers, surface-based computer systems, printers, and power supplies. For example, six major breaks in data collection occurred because of equipment failures during the recovery period following airlift testing of the Ginkgo flow top (3/26-3/31, 1986).

In some cases, appropriate testing methodologies were used, but actual performance of the tests limited their utility with regard to analysis. For example, several constant discharge tests performed in DC-18 used pumping rates that were insufficient to

adequately stress the system. The small drawdowns observed in these tests contribute to uncertainties in calculated values of hydraulic coefficients.

DATA PRESENTATION: Review of data books for DC-23GR and DC-18 and the controlled notebook for DC-23GR revealed limitations in data presentation that impair independent review of testing data. First, graphical data presentations are not included in either the data books or the controlled notebook. The absence of data plots inhibits visual evaluation of test results for consistency with analytical models and data gaps. Second, information for DC-23GR is contained in the data book, the field controlled notebook prepared by the hydrologist, and a field notebook prepared by a person supervising the driller. A reasonably complete account of field activities appears to exist between these records. However, it is difficult for a reviewer to search the different accounts for information such as the diameter of the riser pipe for slug test analysis and the depth of the air line for air-lift pumping. A single controlled notebook for each drillhole could provide a complete chronology of activities at that hole, which could avoid the current possibility of omissions or conflicting descriptions of the same activity. Despite requests for it from the NRC review team, the lack of a controlled notebook for DC-18 prevented more thorough review of the testing at this hole.

IMPLICATIONS FOR LHS TESTING: The NRC review team identified four potential problems associated with LHS testing. The first is the lack of a set of procedures for running a multiple well hydrologic test on a large scale. Second, a procedure does not exist to guide analysis of data from single well or multiple well tests. Such a procedure is essential for interpretation of results to aid in conceptualization of the hydrogeologic framework as well as the estimation of hydrologic coefficients. Third, the limited accuracy of pressure transducers was evident from discussions with BWIP personnel and with team members reviewing hydraulic head data. These limitations may preclude utilization of down-hole or up-hole transducers for measurement of responses from LHS tests. The lack of automated data collection using transducers may be a serious limitation on LHS testing. Finally, the failure of the Westbay equipment in RRL-14 eliminates an important source of data for hydraulic responses in flow interiors. Only RRL-2C is presently designed to allow monitoring of hydraulic responses in flow interiors.

3.2.3 GEOLOGIC INFORMATION

Review of data related to the Cold Creek Syncline Hydrologic Anomaly (the "Yakima Barrier") is presented below.

GEOPHYSICAL DATA: Information provided were in the form of

processed data (contour maps and synthetic seismograms), rather than the original data sets. Thus the reviewers had to rely on DOE's interpretations of the data. The use of ground magnetic data to identify geologic features that could be associated with the Cold Creek hydrologic anomaly is questionable due to the subtle nature of the identified magnetic anomaly in the area and due to the existence of similar magnetic anomalies in other nearby areas where hydrologic anomalies have not been observed.

The Bouguer anomaly pattern observed in the vicinity of drill holes DH-27 and DH-28 is even less apparent than the anomaly observed on the magnetic map. In addition, the identified anomaly may be located to the east of where it has been drawn. Little evidence of an anomaly exists north of drill holes DH-27 and DH-28. However, the apparent anomaly continues south and east which raises questions about correlations between gravity and hydrologic anomalies that have not been inferred to extend farther south and east.

Identification of geologic structures that may be associated with the hydrologic anomaly using the reprocessed seismic data provided to the NRC review team is highly speculative. It is difficult to identify any structures or even any continuous reflectors using this data.

STRATIGRAPHY: A documented procedure and accompanying criteria for the identification of individual basalt flows and of sediments within and among boreholes was not provided. Neither the detailed rock descriptions nor the geophysical logs contained any indication or notation concerning the identification of the basalt flows. The cross sections provided to the reviewers had the names of the flows but no description of how the flows were identified. DOE provided one table that listed graphic logs or geophysical logs as sources of such information, but the document did not provide criteria for stratigraphic identification. According to DOE contractor staff, rock chemistry provides the most reliable data for differentiating individual basalt flows. However, the reviewers have not been provided with procedures for the identification of basalt flows based on rock chemistry. In addition, DOE did not provide documentation to demonstrate that rock units correlated on the basis of geophysical data are necessarily consistent with rock units correlated on the basis of rock chemistry.

HYDRAULIC HEAD DATA: Saddle Mountains head data from DH-27 and DH-28 reveal a difference of only 42 feet across the inferred Yakima Barricade. The head in DH-27 is approximately 475 feet (AMSL) and the head in DH-28 is about 433 feet (AMSL). This head difference is significantly less than the 500-foot (approximate) head difference in the Priest Rapids flow.

GENERAL OBSERVATIONS: Operating procedures have not yet been

developed for newer geophysical exploration techniques such as the vertical seismic profiling which was used by DOE in July 1985 at drill holes DH-27 and DH-28.

BWIP operating procedures (for example, geophysical surveys and geophysical well logging) are supposed to be reviewed on an annual or biannual basis. However, based on entries noted on the procedures forms, the user has no way of knowing if the revised procedures are being followed. For example, the most recent dates on several of the procedures are 1983.

DOE apparently does not have a comprehensive borehole location and status chart. The absence of such a chart may impair the dissemination and utilization of borehole data among geologic and hydrologic reviewers.

Some of the data requested by NRC reviewers, specifically the geophysical logs, were not annotated and did not include a strata identification key. The reviewers requested this key, but were not provided with it during the data review. Without this key, the reviewers could not independently assess or verify DOE's interpretation.

Data collected during aquifer testing at the McGee well do not provide evidence for the existence of a hydrologic barrier west of the RRL. Although DOE has used these data to support the hypothesis of a barrier, DOE's analysis of the testing data was inconsistent with the assumptions of the analytical method. It is apparent that the reviewed data are insufficient to demonstrate the existence of a hydrologic barrier west of the RRL in the vicinity of the Yakima Barricade.

3.1.4 HYDRAULIC HEAD DATA

The water level data in the "NOMAD" data base are manually verified with the original site record. Adjusted water levels are computed for barometric effects in the Hewlett-Packard (HP) site files. Adjusted water levels also are computed separately in the "NOMAD" system. The two separate data files of barometrically adjusted water levels are not verified individually or cross-correlated.

DOE is dependent on manually measured water levels for establishing hydrologic baseline because DOE does not consider the transducer data to be of sufficient accuracy. DOE considers that transducer data are of primary value only for the monitoring of hydrogeologic tests. The absolute accuracy of Seling pressure transducers is insufficient to provide further resolution in

determining hydraulic gradients within the RRL (compared to current water level measurements).

Anomalous water level data are not checked immediately upon observation. The water level data appear to be checked only at the end of the period of record, approximately one week.

The Stevens continuous record water level charts are not digitized and placed in the data-computer acquisition system. Only the initial and the final hand-measured water levels for a given recording period are entered in the data-computer system.

Analysis of the hydrographs requires knowledge of site activity information to correlate observed hydraulic responses with possible perturbations created by the site activities. The hydrographs do not indicate where long inactive monitoring intervals occur. Interpolation between data points is not evident on the hydrographs.

Printouts of head data and hydrographs do not contain references to data packages, procedures, or software used to process these data.

Barometric efficiencies are not recalculated periodically as additional data are collected. Such recalculation could improve the reliability of the calculated barometric efficiencies.

3.1.5 MONITORING INSTALLATIONS

FLUID LOSS/GAINS: Although all requested information was not received from DOE, DOE documents appear to describe drilling fluid losses and gains in sufficient detail for hydrologic evaluations. The calculations and field measurements which are used to determine drilling fluid losses/gains are contained in control notebooks, visulogs, and daily shift reports.

Daily drilling status reports for various wells included a summary of fluid losses/gains. These status reports are not considered by DOE contractors to be part of the official record because they are informal internal memoranda. However, since they were provided to NRC reviewers to summarize drilling fluid losses/gains, it would appear that they should be part of the official record. For example, several data reports were missing on days when actual fluid losses occurred based on drilling shift reports. This error was discovered in a limited review of RRL-17 drilling fluid records.

INTEGRITY TESTING: Results of integrity testing of DB-11,12,14

and RRL-2A revealed casing leaks in DB-14 and RRL-2A and casing shoe leaks in DB-11 and possibly in DB-12. The casing shoe annulus leak in DB-12 could not be verified because water may have been injected into the open hole below the casing shoe. Integrity testing of piezometer nests in DC-19,20,22 and RRL-2C/2B have not been reviewed as part of the data review.

WESTBAY SYSTEM (RRL-14): The Westbay MP system originally installed in RRL-14 is currently non-operational because it was removed from the borehole in October 1986 after pressure testing indicated casing packer leaks. Based on the records presented by DOE/RHO, it appears that DOE contractors have acknowledged the problem that was detected by specified verification procedures. DOE has begun to assess the significance of this problem. It should be noted that hydrologic and hydrochemical data collected in RRL-14 using the Westbay MP system subsequent to October 1985 are of questionable reliability because the exact time of failure of the packer seals and other MP components after initial testing has not been established.

COMPOSITION OF WATER IN PIEZOMETERS: Review of water quality data of shallow bailed samples collected from the piezometers suggests that the tubes are filled with mixtures of Hanford system water and formation water. High pH's (10-11.2) observed in many samples suggest that grout has possibly affected the water chemistry. Because of limited sampling and incomplete or inconsistent data, water chemistry data collected to date do not sufficiently characterize the variation of water chemistry within piezometers.

An additional concern is the apparent sign-off sequence for this data set. Many of the data sheets were signed more than a year after sampling (no analysis date was given). Several data sheets were signed the day before the data review began (12/01/86).

GROUT TESTING: To answer questions about grout permeability, Rockwell performed several tests in both a DOE materials testing lab and by an outside contractor's lab. The permeability testing results of several mix batches of type G cement were consistent between labs and with published literature. The density of the grout mixture was by far the largest factor in influencing permeability. Hydraulic conductivity values ranged from E-9 to E-12 cm/sec. The testing procedures were well outlined and documented, however the actual calculations were not included in the control notebook, nor have they been received in response to requests from the NRC reviewer.

The cement permeability testing considers only matrix permeability; it ignores "microannulus conductivity." The DOE contractor considers that integrity testing of the various piezometers will adequately test for microannular connection between monitoring zones.

During future completions, confidence in grout seals could be improved by collecting samples from the actual grout batches used in piezometer construction and hydraulic testing of these samples under temperature and pressure conditions similar to in-situ conditions for actual grout seals.

3.1.6 HYDROCHEMICAL DATA

Major deficiencies appear to exist in the reporting of hydrochemistry data in the NOMAD data base. The data base does not contain sufficient information to allow independent reviewers to utilize the hydrochemical data contained in NOMAD. For example, analysis of samples DT-86-439 and DT-86-440 illustrates deficiencies of the NOMAD database. The data base indicates that these two samples were collected on subsequent days from the same sampling interval in RRL-14. Although both samples are identified as "system" water, their chemistries differ considerably. Information provided in the NOMAD database is insufficient to explain this difference. NOMAD does not identify references for further information. Controlled notebook RHO-BW-NB-352, however, indicated that sample -439 was collected within the Westbay casing while sample -440 was collected outside the casing. Important sample information has been excluded from the NOMAD data base. Further, the data base does not contain information about important chemical constituents, identify methods of analysis for trace elements, provide cation-anion charge balances, or provide the date on which the samples were analyzed.

UNREPORTED PARAMETERS: Important parameters measured by BWIP hydrology staff are not reported in the NOMAD data base (e. g., sulfide and nitrogen species sampled from DC-18 and DC-23).

DISSOLVED OXYGEN: NOMAD does not provide both of the dissolved oxygen concentrations as determined by the Solution Chemistry Team and Hydrology Testing Team. The Solution Chemistry Team uses an electrode method while the Hydrology Testing Team uses Chemetrics and Hach spectrographic methods. Yet the NOMAD data base only provides the DO value determined by the Solution Chemistry Team.

TRACE ELEMENTS: For trace elements, knowledge of the analytical method used is necessary to evaluate the reliability of their concentrations. However, NOMAD does not indicate the analytical method used for trace element analysis.

ION BALANCES: Cation/anion charge balances and other parameters

used in assessing sample reliability are not provided in the NOMAD database.

ANALYSIS DATE: Although the NOMAD data base identifies the date that the samples were collected, it does not identify when the samples were analyzed. BWIP Operating Procedures specify that the samples be analyzed as soon as possible. However, prolonged storage of samples prior to analysis may degrade the reliability of the sample analysis. In addition, the absence of the analysis date prevents cross-checking the sample analysis by referencing the controlled laboratory notebook.

3.2 DOE OBSERVATIONS

3.3 STATE OF WASHINGTON OBSERVATIONS

No observations were provided for inclusion in the summary meeting notes.

3.4 STATE OF OREGON OBSERVATIONS

The hydrogeologist for the State of Oregon was involved with the review of data presented in Sections 3.1.2 on hydrologic testing, 3.1.4 on hydraulic head data, 3.1.4 on monitoring installations, and attended meetings with NRC personnel where these sections were discussed and endorses the comments and observations in these sections.

3.5 YAKIMA INDIAN NATION OBSERVATIONS

The following draft comments are preliminary, and have been prepared for the meeting summary record. The official and complete comments will be submitted in the near future, and after YIN has received all requested data.

3.5.1 General Comments

1. We believe that all affected parties under NWPA should have access to data and technical information at all stages of the data collection or information gathering development which will be used in the site characterization process. We are concerned that the QA procedures sometimes may be used to limit the access. Therefore, if the affected parties can justify their request of access to the raw data, such data should be made available in a timely fashion.

2. The differentiation between data and data interpreta-

tion can have negative effects on the quality of the data, and the manner in which the data is collected. Limited analysis of data should be carried out and considered as part of the QA procedure in the data collection process.

3. As a consequence, the data review process should be allowed to include some types of raw data, and the analysis conducted during this collection. This will help in the understanding of the data in its final form.

3.5.2 *Comments on QA details necessary for the data review*

1. There are three formats under which information and data are presented:
   a. Hard copies and specifications documents,
   b. Drawings and maps, and
   c. Computer files (tapes).

   Step-by-step quality assurance/quality control should be adequate and traceable to take into account the different nature of such formats.

2. The QA procedures used in data collection and information gathering should document all technical and management steps involved in the creation of the end products so that the objectivity and errors may be evaluated accordingly. Certain internal QA mechanisms should permit dissenting opinions and disagreement to register in the formulation of the data base.

3.5.3 Technical Comments

All specific and detailed technical comments will be made in writing after the Yakima Nation has received the requested information, and has an opportunity to carefully review them.

3.6 UMATILLA AND NEZ PERCE INDIAN TRIBE OBSERVATIONS

1. The documentation was presented in three ways:
   a. Signed and numbered documents.
   b. Unsigned and/or unnumbered drafts.
   c. Personal files of DOE/Rockwell employees.

2. No annotated data on geological or geophysical logs of boreholes was presented. They had to use "draft" cross sections to interpret raw data.

3. Some data documents were signed over one year after they were completed.

4. During Rockwell Management Discussion: Only documentation with signatures and document numbers are considered official; documents without numbers and/or signatures do not officially exist according to Rockwell, even though they were presented at the meeting. That presents a problem in examining data. We are not certain that the data being examined is official.

5. Data is not easily available. DOE could not find all information requested during the meeting.

6. The meeting was poorly organized and poorly planned. The data was unorganized.

7. Lack of coordination both among DOE contractors and among disciplines within DOE and its contractors was evident.

8. Some of DOE contractor's personnel are not "experts" in the field in which they are working and have had to be trained on the job.

9. How stable is grout in high alkalinity (pH up to 11.0)? Cement testing wasn't formalized and may not be adequate.

10. There was no annotated data for water level perturbations on the hydrographs, so perturbations had to be explained verbally during the meeting by Rockwell employees.

11. RHO-BWI-MA-4 (BWIP Operating Procedure) indicated that operating procedures were reviewed annually, but the last date on some pages was 1983 or 1984.

12. Hydrochemical analysis needs a set of operating procedures that define the species to be analyzed and the indicated detection limits. Are data points representing one test, or are they averages of several tests?

13. Incorrect date on Hydrograph discovered by review team was changed by a Rockwell employee during a review meeting without proper QA procedures.

14. The meeting was a good attempt at a coordinated data review on Hydrology.

4.0 DATA PROVIDED TO NRC

Although DOE initially indicated that the data provided for review and referenced in Attachment 3 could be retained by the NRC at the end of the data review, the NRC was subsequently informed by DOE at the close of the data review that DOE would have to release the data through their document management system to ensure that it was releasable.

5.0 DATA REQUESTED BY NRC

Data requested by NRC (Attachments 1 and 6) prior to and during the course of the data review will be forwarded to the NRC by January 30, 1987 in accordance with Section 3.C of the Site Specific Procedural Agreement.

6.0 DISCUSSION

These summary review notes have been discussed in a meeting with the DOE and their contractors. These notes constitute the official record of the Hanford Site Hydrology Data Review performed at Richland, Washington from December 2-4, 1986.

Tilak R. Verma 12/5/86
NRC (WMGT)

DOE/RL

[signature] 12/5/86
NRC (WMRP)

DOE/RL

W. A. Brewer 12/5/86
State of Washington

Ralph O. Patt 12/5/86
State of Oregon

Yakima Indian Nation

C. Gary Collins 12/5/86
Umatilla Indian Tribe

[signature] 12/5/86
Nez Perce Indian Tribe

Attachment No. 2

Nuclear Regulatory Commission
Department of Energy
Basalt Waste Isolation Project
Hydrology Data Review

December 2-4, 1986

	Name	Affiliation	Telephone
	O. O. Thompson	Department of Energy-Headquarters Licensing	FTS 252-5003
	D. H. Dahlem	Department of Energy-Richland Operations Office/Basalt Waste Isolation Division	FTS 444-3022
	D. Marjaniomi	Department of Energy-Richland Operations Office/Basalt Waste Isolation Division	FTS 444-7059
	K. M. Thompson	Department of Energy-Richland Operations Office	FTS 444-6421
**	A. Alkezweeny	Council of Energy Resource Tribes/Tribal Onsite Representative	(509) 943-5301
**	S. Hart	Council of Energy Resource Tribes (Nez Perce, Umatilla)	(303) 832-6600
**	A. Djerrari	Earth Water Air (Yakima Indian Nation)	(612) 332-0000
**	V. Nguyen	Earth Water Air (Yakima Indian Nation)	(612) 332-0000
**	F. K. Kugzruk	Nez Perce Tribal Representative	(208) 843-2253
*	D. L. Chery	Nuclear Regulatory Commission	(301) 433-7665
*	N. Coleman	Nuclear Regulatory Commission/ Waste Management	FTS 427-4131
*	F. R. Cook	Nuclear Regulatory Commission	(509) 943-7669
*	P. Hildenbrand	Nuclear Regulatory Commission/ Waste Management Repository Projects Branch	FTS 427-4672
*	H. Lefevre	Nuclear Regulatory Commission/ Nuclear Materials Safety and Safeguards	FTS 427-4532
*	T. Verma	Nuclear Regulatory Commission/ Waste Management Geotechnical Branch	FTS 427-4053
*	M. F. Weber	Nuclear Regulatory Commission/ Waste Management Geotechnical Branch	FTS 427-4746

* NRC Participants
** States/Indian Tribes participant

	Name	Affiliation	Telephone
*	A. Brown	Nuclear Waste Consultants/ Nuclear Regulatory Commission	(303) 973-7495
*	M. Galloway	Nuclear Waste Consultants/ Nuclear Regulatory Commission	(303) 973-7495
*	F. Marinelli	Nuclear Waste Consultants/ Nuclear Regulatory Commission	(303) 973-7492
*	G. K. Jacobs	Oak Ridge National Laboratory/ Nuclear Regulatory Commission	FTS 626-0567
**	R. Patt	Oregon Water Resources Department	(503) 378-8456
	R. W. Bryce	Rockwell Hanford Operations	FTS 440-4226
	R. M. Carter	Rockwell Hanford Operations/Legal	FTS 444-8958
	J. Fassett	Rockwell Hanford Operations/ Geoscience	FTS 444-6211
	K. A. Hadley	Rockwell Hanford Operations/ Licensing	FTS 444-5597
	S. H. Hall	Rockwell Hanford Operations/ Hydrochemistry Unit	FTS 444-5745
	D. J. Halko	Rockwell Hanford Operations	FTS 440-3841
	B. Hiergesell	Rockwell Hanford Operations	FTS 444-2473
	L. B. Nelson	Rockwell Hanford Operations	FTS 440-3831
	R. Stone	Rockwell Hanford Operations/ Basalt Waste Isolation Project	FTS 444-1065
	S. R. Strait	Rockwell Hanford Operations/ Basalt Waste Isolation Project	FTS 440-5120
*	P. Davis	Sandia Labs/Nuclear Regulatory Commission	FTS 846-5421
**	J. Stohr	State Department of Ecology	(206) 459-6860
**	C. L. Calkins	Umatilla Tribe	(503) 276-3018
*	D. Ralston	Williams and Associates/Nuclear Regulatory Commission	(208) 885-7777
*	R. E. Williams	Williams and Associates Inc./ Nuclear Regulatory Commission	(208) 883-0153
*	G. Winter	Williams and Associates/Nuclear Regulatory Commission	(208) 883-0153
	J. Wittman	Yakima Indian Nation	(509) 865-5121 Extension 397

* NRC Participants

** States/Indian Tribes Participants

VOUCHER

Payor's Name and Address
U.S. Nuclear Regulatory Commission
Division of Accounting
Office of the Controller
ATTENTION: GOV/COM Accounts Section
Washington, D.C. 20555

Payee's Name and Address
Itasca Consulting Group, Inc.
P.O. Box 14806
Minneapolis, Minnesota 55414

Individual to contact:
John J. Markham (612-623-9599)

(a) Contract Number: NRC-02-85-002
(b) Title of Project: Technical Assistance for Design Reviews of High-Level Waste Geologic Repositories
(c) Voucher Number: 016-86-128
(d) Date of Voucher: December 16, 1986
(e) Contract Amount: $1,312,270.80
(f) Fixed Fee: $ 104,981.66

(g) This voucher represents reimburseable costs from November 1 thru November 30, 1986

		AMOUNT BILLED	
		(k) Current Period	(l) Inception to Date
(h)	DIRECT COSTS		
	(1) Direct Labor	$ 3,193.46	$ 63,253.07
	(2) Materials, Supplies and Noncapitalized Equipment	-0-	-0-
	(3) Consultants	1,155.00	67,546.41
	(4) Travel - Domestic	-0-	13,826.96
	(5) Subcontract	2,557.92	27,940.13
	(6) Other Costs	238.04	3,988.45
	TOTAL DIRECT COSTS	7,144.42	176,555.02
(i)	INDIRECT COSTS		
	G & A Expense 106% of Cost Element (1)	3,385.07	67,048.26
	TOTAL DIRECT AND INDIRECT COSTS	10,529.49	243,603.28
(j)	FIXED-FEE EARNED	842.35	19,488.24
(m)	TOTAL AMOUNTS CLAIMED	11,371.84	263,091.52
(n)	ADJUSTMENTS	-0-	-0-
(o)	GRAND TOTALS	$ 11,371.84	$ 263,091.52

SUPPORTING INFORMATION

TASK ORDER-001
TASK 2 DOCUMENT REVIEWS

(h) DIRECT COSTS

(1) Direct Labor

Labor Category	Name	Hours Billed	Rate	Total
Prog. Manager	R. Hart	4.0	$22.12	$88.48
Admin. Manager	L. Gaarder	1.0	$8.25	$8.25
	J. Markham	1.0	$24.04	$24.04
Sr. Engineer	M. Board	43.0	$22.02	$946.86
Secretarial	K. Sikora	2.0	$9.38	$18.76
	L. Gaarder	1.0	$8.25	$8.25
Total Direct Labor				$1,094.64

(5) Subcontract

Nuclear Waste Consultants, Inc.	$1,882.77 *	
	$675.15 *	
		$2,557.92

(6) Other Costs

Copies	$34.21	
Telephone	$37.18 *	
Postage	$10.25	
Publications	12.95 *	
		$94.59
TOTAL DIRECT COSTS		$3,747.15

(i) INDIRECT COSTS

G & A Expense (1.06 x Direct Labor)	$1,160.32
TOTAL DIRECT AND INDIRECT COSTS	$4,907.47

(j) FIXED FEE EARNED	$392.60
(m) TOTAL AMOUNT CLAIMED	$5,300.07

* Invoice Attached

SUPPORTING INFORMATION

TASK ORDER-002
TASK 1 SITE SPECIFIC INSITU TESTING POINT PAPERS

(h) DIRECT COSTS

(1) Direct Labor

Labor Category	Name	Hours Billed	Rate	Total
Admin. Manager	L. Gaarder	1.0	$8.25	$8.25
	J. Markham	2.0	$24.04	$48.08
Sr. Engineer	L. Lorig	6.5	$19.95	$129.68
Secretarial	K. Sikora	1.0	$9.38	$9.38
Total Direct Labor				$195.39

(3) Consultants Labor

	J. Daemen	20	$57.75	$1,155.00 *
Total Consultant Labor				$1,155.00
Total Consultant Labor & Expenses				$1,155.00

(6) Other Costs

Copies	$26.00	
Telephone	$11.73	*
Postage	$6.07	
Courier	$46.00	*
		$89.80
TOTAL DIRECT COSTS		$1,440.19

(i) INDIRECT COSTS

G & A Expense (1.06 x Direct Labor)	$207.11
TOTAL DIRECT AND INDIRECT COSTS	$1,647.30

(j) FIXED FEE EARNED $131.78

(m) TOTAL AMOUNT CLAIMED $1,779.08

* Invoice Attached

SUPPORTING INFORMATION

TASK ORDER-002
TASK 2 THERMOMECHANICAL ANALYSIS

(h) DIRECT COSTS

(1) Direct Labor

Labor Category	Name	Hours Billed	Rate	Total
Admin. Manager	L. Gaarder	1.0	$8.25	$8.25
	J. Markham	2.0	$24.04	$48.08
Sr. Engineer	L. Lorig	1.0	$19.95	$19.95
Asst. Engineer	M. Mack	44.0	$12.00	$528.00
Secretarial	K. Sikora	11.0	$9.38	$103.18
	L. Gaarder	2.0	$8.25	$16.50
Total Direct Labor				$723.96

(6) Other Costs

Copies	$7.90	
Postage	$5.27	
		$13.17
TOTAL DIRECT COSTS		$737.13

(i) INDIRECT COSTS

G & A Expense (1.06 x Direct Labor)	$767.40
TOTAL DIRECT AND INDIRECT COSTS	$1,504.53
(j) FIXED FEE EARNED	$120.36
(m) TOTAL AMOUNT CLAIMED	$1,624.89

* Invoice Attached

SUPPORTING INFORMATION

TASK ORDER-003
TASK 1 POINT PAPER ON ROCKBURST POTENTIAL

(h) DIRECT COSTS

(1) Direct Labor

Labor Category	Name	Hours Billed	Rate	Total
Admin. Manager	L. Gaarder	2.0	$8.25	$16.50
	J. Markham	2.0	$24.04	$48.08
Sr. Engineer	M. Board	29.0	$22.02	$638.58
	J. Markham	3.0	$24.04	$72.12
Secretarial	L. Gaarder	1.0	$8.25	$8.25
	K. Sikora	6.5	$9.38	$60.97
Total Direct Labor				$844.50
TOTAL DIRECT COSTS				$844.50

(i) INDIRECT COSTS

G & A Expense (1.06 x Direct Labor)	$895.17
TOTAL DIRECT AND INDIRECT COSTS	$1,739.67
(j) FIXED FEE EARNED	$139.17
(m) TOTAL AMOUNT CLAIMED	$1,878.84

* Invoice Attached

SUPPORTING INFORMATION

TASK ORDER-003
TASK 2 IDENTIFICATION OF UNDERGROUND SYSTEM DESIGN COMPONENTS

(h) DIRECT COSTS

(1) Direct Labor

Labor Category	Name	Hours Billed	Rate	Total
Admin. Manager	L. Gaarder	1.0	$8.25	$8.25
	J. Markham	2.0	$24.04	$48.08
Sr. Engineer	L. Lorig	9.5	$19.95	$189.53
Secretarial	K. Sikora	9.5	$9.38	$89.11
Total Direct Labor				$334.97

(6) Other Costs

Copies	$21.80	
Telephone	$15.94	*
Postage	$2.74	
		$40.48
TOTAL DIRECT COSTS		$375.45

(i) INDIRECT COSTS

G & A Expense (1.06 x Direct Labor)	$355.07
TOTAL DIRECT AND INDIRECT COSTS	$730.52

(j) FIXED FEE EARNED	$58.44
(m) TOTAL AMOUNT CLAIMED	$788.96

* Invoice Attached