Wm-70

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

MAY 8 1986

MEMORANDUM FOR: Edward F. Hawkins, URFO

FROM: Myron H. Fliegel, Section Leader
WMGT

SUBJECT: REVIEW OF MONUMENT VALLEY DRAFT REMEDIAL ACTION PLAN

In accordance with your recent request, Ted Johnson has completed a review of the subject remedial action plan. Our surface water hydrology and erosion protection comments and questions are enclosed.

In general, we conclude that the proposed remedial action plan is unacceptable. Due to serious flooding and erosion conditions at this site, we consider that it may be difficult to provide a design which meets EPA standards and that serious consideration should be given to moving the pile to an alternate location.

If you have any questions, please contact Ted Johnson at 427-4490.

Myron H. Fliegel, Section Leader
WMGT

Enclosure:
As Stated

A11

Monument Valley DRAP
Surface Water Hydrology
Questions and Comments

1. Our review of surface water hydrology and erosion protection aspects of the proposed design indicates that the site is located in an extremely flood-prone area and that the proposed erosion protection may not be adequate.

   (a) The apron and erosion protection along the southern and northern portions of the pile are designed with fairly steep slopes (in the direction of flow). It is doubtful that the proposed 4" (average D_{50}) rock can resist velocities produced by a PMF. Regardless of the size of the watersheds, the times of concentration for these portions of the apron will be very short and the PMF will likely be larger than possibly expected due to the steepness of the terrain. Your conclusion that there will be no significant flooding impacts (page B-45) is not supported by any information regarding natural bedrock contours or flow velocities.

   For the purposes of a draft RAP, information should be provided to document the ability of the apron to resist a PMF. Such information should include (1) apron width, shape, and cross-sections, including location of bedrock; (2) apron slope(in the direction of flow); (3) drainage area(s); (4) PMF peak flow(s); (5) PMF velocities at various points along the apron; (6) riprap and riprap toe requirements; (7) details of exit of ditch to natural topography, including depths to bedrock at the exit point; and (8) topographic maps and cross-sections of the area showing washes, channels, and design features.

   (b) The apron and erosion protection along the eastern portion of the pile should be designed to resist a PMF in Cane Valley Wash, assuming that a shift in the main channel occurs. Geomorphic evidence indicates that there is a potential for major channel changes in the alluvial floodplain. We do not agree that the proposed design, which allows for undercutting of the rock toe and rock apron (with subsequent collapse), is acceptable, particularly if it is possible to key the erosion protection into bedrock. The erosion protection should be designed assuming that the altered channel is very close to the pile, unless it can be conclusively documented that such a phenomena could not reasonably occur. The erosion protection should be sufficient to withstand PMF channel velocities and should be keyed into bedrock, if possible.

(c) The erosion protection for the east side (and possibly the south side) of the pile should also be designed to resist flooding and lateral erosion in the small tributaries which parallel and discharge to Cane Valley Wash. The information provided is not sufficient to establish what effects these steep washes will have on the pile. In order to document the effects of these channels, it will be necessary to provide design information similar to that requested in 1(a), above. Additionally, the potential effects of lateral erosion and headcutting for these channels may need to be considered, depending on velocities and bedrock elevations.

(d) The erosion protection for the west side of the pile may need to be designed to withstand flooding and erosion since it appears that significant potential exists for lateral erosion and/or gullying.

Overall, the NRC staff concludes a significant amount of additional documentation and design changes may be needed in order to demonstrate the acceptability of the site remedial action design. Because of the site location in a floodplain at the base of steep, highly-eroded slopes and the potential for significant geomorphic changes to occur, it is likely that the erosion protection design will require significant modifications, which may prove to be very costly to implement and, in fact, may be very difficult to design. We also conclude that strong consideration should be given to moving the pile to a more stable location, especially in light of the measures that will be needed to provide adequate flood protection.

2. The NRC staff does not necessarily agree with the rock durability criteria outlined in DOE's Technical Approach Document (TAD), and does not agree that these criteria are acceptable. In general, the criteria in the TAD are much less stringent than other normally acceptable criteria, such as the USBR criteria for good-quality rock. However, we do agree that oversizing may be a viable alternative and can only be evaluated after additional durability tests are performed.

Based on the preliminary data provided it does not appear that the rock from the Alhambra Rock source will meet USBR criteria for even poor-quality rock. We suggest that additional efforts be made to locate rock of better quality. If such rock cannot be found, DOE should indicate the methods and criteria that will be used to oversize the poor-quality rock that is available.

C	:WMGT	:WMGT					
ME	:TJohnson	:MFliegel					
TE	:86/05/	:86/05/					

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Dan:
A couple of years ago Scott Grace reviewed the Mexican Hat ground water portion of the RAP and provided me with the attached write-up.
Do whatever you want with it

Lucy

B/2

WM-63/SRG/89/09/15/TER

URFO: SRG
Docket No. 40-63
0400WM63700E

NOTE TO: Ray Gonzales,
Team Leader for UMTRA Sites

FROM: Scott Grace
Project Manager

SUBJECT: THE GROUND-WATER SECTION OF THE MEXICAN HAT TECHNICAL EVALUATION REPORT (TER)

Attached is the ground-water section for the Mexican Hat Technical Evaluation Report (TER). I have written the characterization, water quality, and summary sections. I also referenced pertinent correspondence with DOE. I have concluded that due to the hydrogeology, that they is likely to be no need for restoration at the Mexican Hat site. The subject report does not specifically discuss the relocation of the Monument Valley tails. With respect to the Mexican Hat site, relocation of Monument Valley tails does not add impact or change my findings. We do not have current information on the characterization of Monument Valley so the potential need for restoration at the Monument Valley site has not been reviewed by me. Therefore, someone else will need to assess the need for restoration when the information becomes available.

Scott R. Grace,
Project Manager

cc: G. Konwinski

1.0 GROUND WATER

1.1 Ground-Water Characterization

The Mexican Hat tailings site is situated on outcrops of the Halgaito Shale Member of the Cutler Group. Underlying this unit is the Honaker Trail Formation. Locally, these strata dip 6 to 8 degrees to the east-southeast, towards the axis of the Mexican Hat syncline.

The Halgaito Shale Member is an erratic sequence of thinly to thickly bedded siltstones and silty shales, with thin, discontinuous beds of silty limestone. The Halgaito Shale is reported to be up to 50 to 100 feet thick in the vicinity of the site. The contact between the Haligaito Shale and the underlying Honaker Trail Formation is reported to be gradational and indistinct. DOE reports that the Haligaito-Honaker contact occurs along the base of Gypsum Creek. Based upon two field trips (April 1988 and April 1989) to the site, it was generally agreed (DOE, Navajo Nation and NRC) that there is uncertainty with the stratigraphic position of the base of Gypsum Creek. However, there is certainty that this is a hydrostrati-graphic boundary. This is further discussed below.

The DOE has identified three hydrostratigraphic units in the vicinity of the Mexican Hat site. Ground water in the upper hydrostratigraphic unit occurs under unconfined conditions within the Haligaito Shale Member. Water in this system is primarily a result of seepage from the tailings and is of limited areal extent. This unit contains perched zones at relatively shallow depths. DOE has calculated an average hydraulic gradient within this unit of 0.04. Hydraulic conductivity values range between 0.01 foot per day (ft/day) and 0.38 ft/day with an average of 0.04 ft/day. Comparison of water levels in wells showed a downward vertical gradient.

The second (middle) hydrostratigraphic unit is identified as the confined strata of the lower Haligaito Shale and upper Honaker Trail (corresponds with the strata at the base of Gypsum Creek). Overlying and confining this unit are approximately 40 feet of low-permeability, well-consolidated siltstones. Hydraulic conductivity ranges from 0.2 to 0.76 ft/day with an average of 0.15 ft/day. An upward hydraulic gradient of 0.04 was determined from well data. The upward gradient is artesian in the vicinity of the tailings (well 907) and in Gypsum Creek. Seeps in Gypsum Creek were observed to be flowing under artesian pressure.

The third (lower) hydrostratigraphic unit contains ground water and naturally occurring hydrocarbon compounds under confined conditions. This unit is the upper Honaker Trail formation. This unit is related to the Mexican Hat oilfield to the north of the site. Due to the widespread, ambient "contamination" not due to milling activities, this unit could be considered Class III ground water (as per Draft 40 CFR 192.10(e)).

The staff concludes that the uppermost aquifer consists of the lower Haligaito Shale and the Uppermost Honaker Trail Formation (the middle

hydrostrati-graphic unit). The staff concludes that the perched ground water of the upper Haligaito Shale is not an "aquifer" and therefore not a portion of the uppermost aquifer. The basis of this conclusion is that the perched ground water was created by the Mexican Hat uranium recovery operations, and there is no evidence to suggest (1) interconnection to a natural aquifer, (2) capability of discharge to surface water, or (3) accessibility beyond the site boundary. This information was relayed to DOE in an April 11, 1989 letter. Figure 1.1 shows the location of the wells and springs at the site. The unit monitored by the wells is indicated by Figure 1.1.

1.2 Ground-Water Quality

Water quality of the upper and middle hydrostratigraphic units is classified as brackish, moderately hard to hard, and is a calcium-sulfate type ground water. Figure 1.2.1 is a trilinear diagram of ground water from the site (from Figure D.7.9, page 202, of Appednix D of the DOE Jyly 1988 Final R.A.P.). Table 1.2.1 summarizes the water quality of the middle hydrostratigraphic unit (from Table D.7.8, page 2-13 of the DOE July 1988 Final R.A.P).

In a letter dated April 11, 1989, NRC requested DOE to propose background and point of compliance well locations for the Honaker Trail Formation (middle hydrostratigraphic unit) the uppermost aquifer. DOE responded June 8, 1989, by proposing installation of two point of compliance wells downgradient of the disposal cell and one upgradient background well. DOE stated that the background well may be an existing well (such as 909) or a new well. The locations of these proposed wells are also shown in Figure 1.2.1.

A summary of the concentrations of hazardous constituents for well 909 (possible background well) is listed in Table 1.2.2. These values are the average of the available data (from Table D.7.6, pages D-45 through D-47, of Volume I of the DOE January 1989 Modification to the Final R.A.P).

1.3 Ground-Water Impacts and Restoration

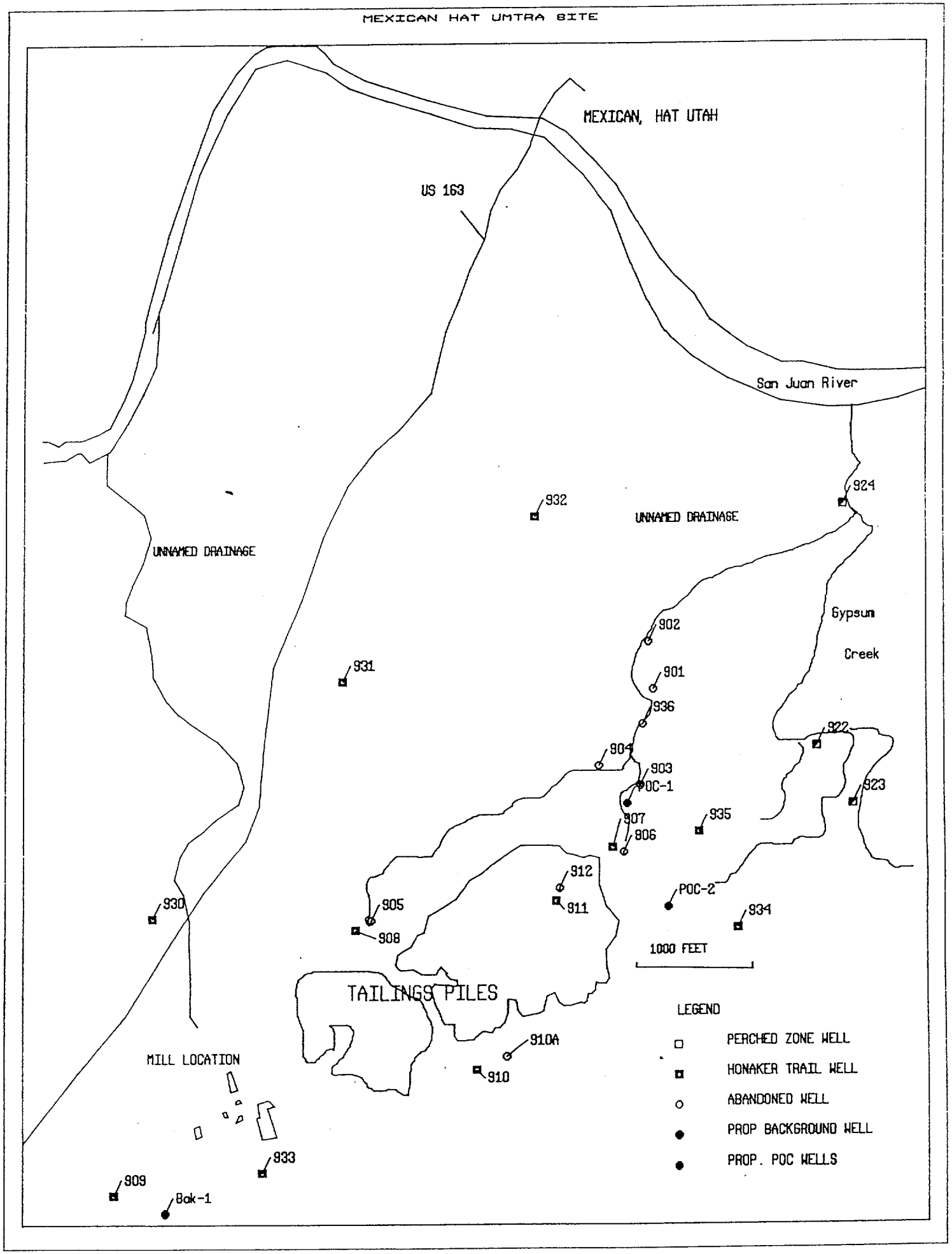
Tailings seepage has entered the upper hydrostratigraphic unit. The seepage appears to be located in perched zones in this unit. As discussed above, this unit is not considered an aquifer and is therefore not part of the uppermost aquifer. No restoration will be required as long as this designation remains (i.e. DOE does not resaturate the tailings during remedial action, as was done at the Durango/Bodo Canyon site, causing renewed seepage into the perched zone).

DOE was asked to evaluate the potential for resaturation of the tailings in a letter dated April 11, 1989. DOE responded June 8, 1989. DOE has concluded that construction water usage is not excessive and is not expected to result in tailings resaturation.

Due to the significant upward vertical gradient (artesian) in the middle hydrostratigraphic unit (the uppermost aquifer), any seepage migration through the upper hydrostratigraphic unit could not enter the middle unit. Therefore, it is unlikely that the uppermost aquifer is or could be affected by tailings seepage. Therefore, no restoration of ground-water at the Mexican Hat is anticipated.

1.4 Conclusion

The perched ground-water zone, or upper hydrostratigraphic unit, is not considered an aquifer because there is no evidence to suggest it is interconnected to other aquifers or surface water and is not accessible beyond the site boundary. Therefore, the uppermost aquifer consists of the middle hydrostratigraphic unit. There is no evidence to suggest tailings seepage ever entered this unit due to the strong upward vertical unit. Therefore, the staff concludes that the Draft 40 CFR Part 190.02(a)(3) ground-water protection standards are met. However, to judge compliance, a detection monitoring program will need to be implemented (background and point of compliance well monitoring).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San Juan River
UNNAMED DRAINAGE
UNNAMED DRAINAGE
Gypsum
Creek
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PERCHED ZONE WELL
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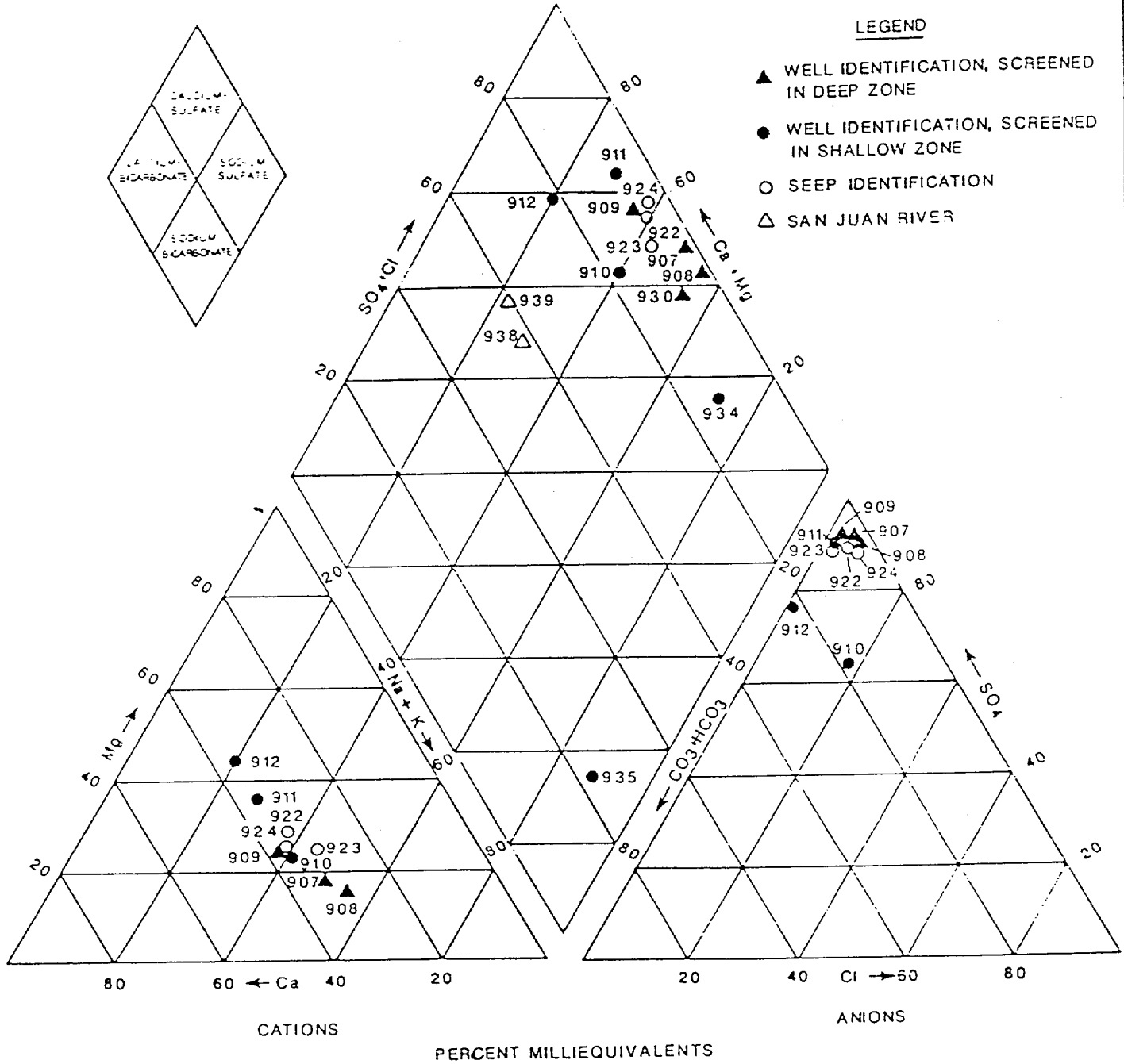

FIGURE D.7.9

TRILINEAR DIAGRAM, MEXICAN HAT SITE

Table 1.2.1 - Ground-Water Quality Summary for Middle Hydrostratigraphic Unit at Mexican Hat Tailings Site

Constituent	Observed concentration range[a]	Number of analyses	Mean	Two standard deviations
Alkalinity	59-140	7	110	58
Aluminum	<0.1-0.4	6	0.2	0.2
Ammonium	<0.1-0.1	6	0.1	0.0
Antimony	<0.003-0.007	6	0.004	0.004
Arsenic	<0.01	7	0.01	0.0
Barium	<0.1-0.2	7	0.1	0.01
Boron	1.0-4.7	6	2.4	3.4
Cadmium	<0.001	7	0.001	0.0
Calcium	153-600	7	420	302
Chloride	38-240	7	167	164
Chromium	<0.01-0.07	7	0.04	0.04
Cobalt	<0.05-0.07	7	0.05	0.02
Copper	<0.02-0.05	7	0.03	0.03
Cyanide	<0.01	6	0.01	0.0
Elec. Conductivity	2000-6000	7	4250	2986
Fluoride	1.2-1.5	7	1.4	0.2
Iron	<0.03-0.2	7	0.1	0.1
Lead	<0.01-0.04	7	0.01	0.02
Magnesium	47-200	7	161	104
Manganese	<0.01-0.06	7	0.03	0.04
Mercury	<0.0002-0.0006	7	0.0003	0.0003
Molybdenum	<0.01-0.2	7	0.07	0.2
Nickel	<0.04-0.13	7	0.07	0.08
Nitrate	<0.1-4	6	1.3	2.8
Nitrite	<0.1	7	0.1	0.0
Total Organic Carbon	16-31	6	22	11
pH	7.05-10.24	7	7.79	2.23
Phosphate	<0.1-0.2	6	0.1	0.08
Potassium	5.6-11.1	7	9.0	3.8
Selenium	<0.005	7	0.005	0.0
Silica	11-15	6	13	3
Silver	<0.01	7	0.01	0.0
Sodium	340-1320	7	832	796
Strontium	<0.1-0.4	7	0.1	0.2
Sulfate	1190-4090	7	3004	2170
Sulfide	<0.1	6	0.1	0.0
Tin	<0.005	7	0.005	0.0
TDS	1870-6550	7	4865	3476
Uranium	<0.003-0.05	7	0.016	0.045
Vanadium	<0.01-0.6	7	0.3	0.5
zinc	<0.005-0.188	7	0.03	0.14
Gross alpha[b]	0-60 ± 28	6	21	50
Gross beta[b]	1-120 ± 17	6	32	88
Lead-210[b]	0-2.3 ± 1.1	7	0.9	1.6
Polonium-210[b]	0-0.3 ± 0.7	7	0.07	0.3
Radium-226[b]	0-3.5 ± 0.4	7	1.3	2.9
Radium-228[b]	0-0.7 ± 1.0	7	0.5	0.4
Thorium-230[b]	0-0.3 ± 0.6	7	0.2	0.3
Temp., degrees	16-19.5	7	17.6	2.2

[a] Concentrations in milligrams per .iter (mg/l) unless other wise noted.
[b] pCi/g picocuries per liter.

Table 1.2.2 - Summary of Hazardous Constituent Data for Well 909 (Tentative Background Well)

mg/l	Mean of Baseline
Antimony	< 0.005
Arsenic	< 0.01
Barium	< 0.01
Cadmium	< 0.001
Chromium	< 0.0475
Cyanide	< 0.01
Gross Alpha (pCi/l)	38.2
Lead	< 0.01
Mercury	< 0.0002
Molybdenum	< 0.03
Nickel	< 0.05
Nitrate	5.2
Lead-210 (pCi/l)	0.1
Polonium-210 (pCi/l)	0 ± 0.6
Ra-226/228 (pCi/l)	0.5
Selenium	< 0.005
Silver	< 0.01
Thorium-230 (pCi/l)	0.45
Uranium (pCi/l)	30.7

Document Name:
WM-63/SRG/89/09/15/TER

Requestor's ID:
SCOTTG

Author's Name:
Scott Grace

Document Comments:
Mexican Hat TER

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March 10, 1992

NOTE TO: Ted Johnson
Dan Rom
Mike Layton
Roy Miller
Allen Mullins

FROM: Mohammad Haque

SUBJ: Proposed Trip to Mexican Hat/Monument Valley

As we progress in the review of the Remedial Action Plan documents for the Mexican Hat and Monument Valley, UMTRA sites, and are getting ready to write draft TER, it seems appropriate to have a site visit. This will give us an opportunity to familiarize with the site conditions and to meet with DOE and TAC staff to discuss our questions and concerns.

I am planning a trip for our site visit for March 30-April 3, 1992 week as discussed with you. As soon as the schedule is finalized, I will let you know. Please have your questions and concerns listed and be prepared to discuss them in the site meeting. I will like to get a copy of your comments before we leave.

M. H.
Mohammad Haque

cc: D. Gillen
J. Surmeier

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