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MEMORANDUM FOR: Leo B. Higginbotham, Chief, WMLU
Division of Waste Management

FROM: Malcolm R. Knapp, Chief, WMGT
Division of Waste Management

SUBJECT: COMMENTS ON THE UMTRA PROJECT SURVEILLANCE AND
MAINTENANCE PLAN (PSMP)

As requested in TAR 85027, we have reviewed the geoscience aspects of DOE's UMTRA Project Surveillance and Maintenance Plan (PSMP: UMTRA-DOE/AL-350124). Although our preliminary review indicated that the quality of this document is significantly higher than site-specific UMTRAP assessments, we concluded that DOE's preparation and NRC's approval of such a plan is premature in light of existing uncertainties about the licensing process for UMTRAP sites. Based on our review, we question the purpose of the plan, which is stated on page 1 as to describe the procedures that will be used by NRC and DOE (or other responsible agency) to verify that stabilized UMTRAP sites comply with licensing requirements and the EPA standards (40 CFR Part 192, Subparts A, B and C) during the stabilization period. Our question of the plan's purpose is based on the following three concerns:

1. The purpose of the plan should be to describe procedures that DOE will use to verify compliance with NRC's licensing requirements, rather than procedures for NRC to use in evaluating this compliance;
2. The development of compliance verification procedures for licensing requirements is premature because the requirements have not yet been generically identified by NRC; and
3. The plan does not distinguish between NRC's license requirements, which may require surveillance and maintenance during the period of stabilization, and the EPA standards, which do not require surveillance and maintenance because compliance is determined on a design basis.

We are concerned that the anticipated existence of monitoring and maintenance provisions in licenses may be viewed as alternatives to site characterization and design that must alone provide reasonable assurance of compliance with the EPA standards in the precicensing stage of the UMTRA Project. It is our understanding that such provisions are required prior to NRC's concurrence with Remedial Action Plans (RAP's) and that maintenance and monitoring cannot be relied upon to provide necessary assurance at those proposed UMTRAP sites where reasonable assurance of compliance with the EPA standards is uncertain.

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We endorse the application of surveillance techniques described in the plan, such as aerial photographic interpretation, for post-remedial action surveillance of the stabilized sites. As we have commented in previous UMTRAP site reviews, DOE can apply many of these same techniques to significantly improve the quality and reliability of site characterizations before the initiation of the remedial actions.

Our review of the PSMP also suggested the need for NRC to accelerate the development of the UMTRAP site licensing process, including anticipated types of license requirements so that DOE may continue to plan for surveillance and maintenance pursuant to NRC licenses. If you would like the participation of my branch, I would be happy to discuss how WMGT can support the development of the licensing process.

This review has been coordinated by Michael Weber (Groundwater Hydrology) with review support from Kristin Westbrook (Geology), William Dam (Geochemistry), and Ted Johnson (Surface Water Hydrology). Because of the number of UMTRA projects currently under review and preparation in WMGT, our review of the PSMP was rapidly prepared to meet your coordinated schedule with DOE. Thus the conclusions of the review and comments should be viewed as preliminary. Subsequent reviews of the plan may generate additional comments, especially as a clearer description of the UMTRAP licensing process emerges. If you have any questions about our review or comments, please contact Mr. Weber.

Original Signed By

Malcolm R. Knapp, Chief, WMGT
Division of Waste Management

Enclosure:
WMGT Comments on the UMTRA PSMP

DFC : WMGT MW	: WMGT MK	: WMGT MK	: WMGT MK	:	:	:
NAME : MWeber:mw	: MFliegel	: PJustus	: MKnapp	:	:	:
DATE : 85/05/17	: 85/05/17	: 85/05/17	: 85/05/17	:	:	:

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WMGT COMMENTS ON THE
UMTRA PROJECT SURVEILLANCE AND MAINTENANCE PLAN

Section 1.1, Pg. 1

The PSMP states that its purpose is to describe the procedures that will be used by NRC and DOE (or other responsible agency) to verify that UMTRAP depositories remain in compliance with NRC's licensing requirements and the EPA standards for remedial actions at UMTRAP sites (40 CFR Part 192, Subparts A, B, and C). This purpose statement and the perceived purpose of the plan require revision to address the following concerns:

1. The PSMP does not describe procedures that will be used by NRC to verify compliance with license conditions or the EPA standards. Such procedures are not included in the document. The purpose of the plan is not to describe procedures to be used by NRC, but rather to describe procedures that DOE will use to demonstrate compliance with NRC's licensing requirements. Inclusion of procedures for NRC to follow would prompt a question about the propriety of the relationship between DOE and NRC, for in this situation, the licensee would be writing a document that would instruct the licensor how compliance with the license shall be evaluated.
2. Identification of compliance verification procedures for licensing conditions that have not yet been developed appears to be premature. If the NRC would decide that a generic monitoring or maintenance provision was required but procedures for verification of compliance with the provision were not included in the PSMP, the surveillance and maintenance plan would be incomplete and would require modification. Until the types of surveillance and monitoring requirements have been identified by NRC, development of procedures to verify compliance with the requirements should be postponed.
3. The plan does not clearly distinguish between NRC's licensing requirements, with which compliance will be required during the period of stabilization, and the EPA standards, which do not require verification for compliance determinations. The EPA standards are design standards, and thus they do not require monitored performance evaluations for NRC to determine that sites comply with the standards with reasonable assurance. The PSMP appears to draw the conclusion that license requirements will replicate the EPA standards. Because the NRC will decide what license requirements are necessary to protect the public health and safety and the environment, the license

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conditions may require monitoring and maintenance in excess of that implied by the EPA standards, provided that the NRC finds with reasonable assurance that the remedial actions comply with the EPA standards at the times of concurrence with the RAP and certification report.

Our concern with the purpose of the PSMP addresses the relationship between strong programs of characterization and design early in the UMTRA Project and implementation of maintenance, monitoring, and additional remedial actions during the long period of stabilization. Maintenance and monitoring programs cannot be considered substitutes for site characterizations and designs that provide for the NRC's finding that the planned actions comply with the EPA standards with reasonable assurance. At sites where the NRC staff has reasonable doubt that the remedial actions may not comply with the standards, inclusion of maintenance and monitoring requirements in site licenses will not provide the necessary assurance to remove this doubt. Primary emphasis in the UMTRA Project during site planning, characterization, and remediation should be focused on designing tailings depositories that comply with the EPA standards independent of post-remedial action maintenance and monitoring programs.

Section 1.0, Pg. 1

It is recognized in this section that the plan "may" require modification after the initial 10-year interval because such phenomena as chemical and physical weathering of rock covers would be observable only over a longer time period. Waiting for the initial 10-year results before making any further detailed plans is an acceptable approach. However, it can be anticipated in advance that geological processes will need surveillance beyond 10 years after the completion of remedial action work. A definite commitment for surveillance beyond the initial 10-year interval for geologic processes would be appropriate.

Section 1.2.1, Pg. 2

This section contains a list of documents and materials used to characterize final site conditions. This list also needs to include geologic maps, core logs, geophysical logs, and geologic cross sections. All of these geologic documents should exist as part of the results of site characterization activities.

Section 1.3, Pg. 4

The PSMP omits certification as a step in the surveillance and monitoring process at UMTRAP sites. NRC staff considers that certification following

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remedial action is a critical step in the process because it discerns portions of the site that may be released for unrestricted use from portions that must remain isolated to protect the public and environment. These isolated areas thus become the focus of the surveillance and monitoring programs required in site licenses. Consistent with this consideration, NRC staff recommends that the PSMP be revised to identify certification as a key step in the surveillance and maintenance process.

Section 1.3, Figure 1.1, Pg. 6

The diagram of the Surveillance and Maintenance Plan (Figure 1.1) is missing an arrow from block 13 (Resume Phase 1 Inspection and Detection Monitoring) back to block 1 (Phase 1 Inspection and Detection Monitoring). Without this feedback loop, the process would terminate after a problem was identified that did not breach site integrity and did not require maintenance or that was remediated and certified to NRC. As the diagram is presently illustrated, two or more sequential problems could not be identified at any particular site.

Section 2.3, Pg.9

It is indicated in this section that if a U.S.G.S. 1:24,000 scale topographic map is not available, the best available alternate will be obtained. The concept of what is acceptable as a best available alternate needs to be better defined. The PSMP should be revised to discuss contingent plans to develop the vicinity map in the event nothing reasonably close to a USGS 1:24,000 scale topographic map is available.

In addition, this section indicates that descriptive information will be appended to the vicinity map. Some examples of the types of descriptive information to be included are given, but these example exclude geologic information. Geologic descriptive information should also be included such as geologic units, fracture and fault descriptions, and geomorphic feature descriptions.

Section 2.3.2, Pg. 9

The PSMP states that the scale of site topographic maps will not be less than 1:24000. Based on the stated purpose of these maps, the NRC staff concludes that even maps of this scale may be too small-scale for site surveillance and recommends 1:2000 as the minimum scale for the topographic maps.

Section 2.5 states that the site map discussed in section 2.3.2 will constitute the topographic base for the detailed site atlas, which will be used on site inspections. In addition to aiding site inspections, the site atlas will

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record site conditions after completion of remedial actions. Thus the topographic map should be sufficiently detailed to determine small-scale, gradual changes in surface topography caused by erosion, subsidence, and other processes. A 20-acre, square tailings embankment would be represented on a 1:24000 scale map as a square 1/2 inch on a side. Even at the larger scale of 1:2000, the same embankment would only measure 6x6 inches. For comparison, EPA requires owners and operators of hazardous waste management facilities to submit topographic site maps with minimum scales of 1:2440 with special consideration provided for very large sites (40 CFR Part 270.14(b)(19)).

NRC recommends that the PSMP be revised to state that 1:2000 should be the minimum scale of the topographic site maps. If the site is too large to be mapped conveniently on this scale on a single sheet, the map scale could be reduced for the preparation of a base map of smaller scale provided that this base map is accompanied by a series of larger scale maps that collectively depict the topography and relevant features of the site at scales greater than or equal to 1:2000.

Section 2.5, Pg.10

The PSMP states that base map overlays will be prepared. The list of information for the overlays should also include surface geomorphic features that represent dynamic processes.

Section 2.6.3, Pg. 15

The PSMP states that every site will be marked with two site markers and refers to Figure 2.3. Figure 2.3, however, only illustrates one site marker. The plan should be revised to remove this inconsistency by illustrating another marker in Figure 2.3.

Section 2.6.4, Pg. 15

The PSMP states that signs will be placed around the perimeter of the site to forbid trespassing, indicate the presence of uranium mill tailings, and state that the site is U.S. government property, but they do not indicate that the tailings are radioactive. To rectify this omission, the PSMP should be revised to stipulate that the perimeter warning signs will also caution about the presence of radioactive materials contained on-site.

Section 2.7, Pg. 17

This section of the PSMP implies that new monitoring wells installed after the completion of remedial actions will be preferred to existing wells because the

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preference will ensure that the wells are constructed in accordance with standard practices. This suggests that monitoring wells that are installed prior to initiation of remedial actions are not being constructed properly, such as proper and uniform well completion and development or consistent and complete documentation of all field procedures. This suggestion also indicates that revision to present monitoring well installation practices at UMTRAP sites may be required to ensure that the monitoring wells provide reliable and representative data. Since the primary emphasis in the UMTRA Project should be on "doing the job right" the first time, the procedures described in the PSMP requiring higher quality evaluations after the remedial actions are completed appear to be inconsistent. To rectify this inconsistency, the installation procedures for pre-remedial monitoring wells should be upgraded to provide as reliable information as the post-remedial action wells could provide. These upgrades would include proper and complete coring and archiving, proper and uniform well completion and development, consistent and complete documentation of all field procedures, and accurate characterization of hydrogeologic units penetrated by the wells using downhole geophysical logging (e.g., caliper, gamma-gamma, resistivity, neutron logs).

In addition, continued monitoring of pre-remedial wells during and after remedial actions may provide objective estimates of the success or failure of the remedial actions in protecting water resources. Greater emphasis should be placed on the importance of these wells in the PSMP.

Section 2.7, Pg.17

This section indicates that core logs and geophysical logs will be run in boreholes installed following remedial action because such logs are useful in determining site geology. The site geology should be well known and understood prior to initiation of remedial action construction work. Additional geologic information from wells installed after remedial action should be compared to existing well data and geologic cross sections and the results should be documented.

Section 2.7.1, Pg. 18

The PSMP states that minimum acceptable core recovery will be 90% for core sampling when boreholes are drilled in rock. Core recovery, however, is not solely dependent on the skills and equipment of the driller coring the borehole. Core recovery greater than 50% may be practically impossible in incompetent rock. The PSMP should be revised to state that the driller shall make every reasonable effort to maximize core recovery.

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After the core samples have been collected, the PSMP states that the responsible agency will archive the samples for future reference. However, the plan does not mention that the cores will be recorded using lithologic logs based on core interpretations or using photographs. The lithologic logs and the photographs prepared from the core provide a more convenient archival medium than the core itself, which is difficult to transport and communicate. Such secondary references are often critical in the core archival process, especially since cores are often destroyed or discarded through time if they are not studied. NRC staff recommends that the PSMP be revised to provide for archival of the core and other appropriate records, such as accurate and scaled photographs and lithologic logs based on the core.

With respect to drilling techniques, the PSMP states that all borings through unconsolidated materials will be performed using 6-inch hollow stem augers. Decisions about appropriate drilling techniques, however, are often best made on a site and well specific basis. This degree of detail is inappropriate for a generic document such as the PSMP. Hollow stem augers may not be capable of drillings through certain types of unconsolidated materials (e.g., extremely cobbly gravels). In these situations, the well driller would have to violate the procedures in the PSMP or sacrifice the installation of a monitoring well. NRC recommends that the PSMP be revised to delete the requirement that six-inch hollow stem augers will be used for all borings through unconsolidated materials.

Section 2.7.2, Pg. 19

The PSMP states that the lengths of screened intervals in monitoring wells will be determined by the location of the static water table, hydrostratigraphy, and uniformity between comparable wells. The hydraulics of the groundwater flow system, however, are not listed as a factor for consideration. During previous reviews of UMTRAP site characterizations, the NRC staff has questioned the selection of screened interval lengths, especially in groundwater systems where vertical hydraulic gradients were significant with respect to estimates of the rates and directions of groundwater flow. The NRC staff considers the hydraulics of the groundwater flow system to be a key factor for consideration in selecting the lengths of screened intervals in groundwater monitoring wells. Consequently, the staff recommends that the PSMP be revised to include groundwater hydraulics as a factor for consideration in selecting the lengths and locations of screened and packed intervals.

The PSMP also states that screened intervals and gravel packs will extend from the measured water level downward. This requirement is ambiguous because the plan does not explain how it would be applied. If, for example, an upper confined aquifer at a site was monitored, the well should only be screened

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within this aquifer and not up to the water table in an overlying unconfined aquifer, as the plan could be interpreted to require. If the screened interval and gravel pack extended through the unconfined aquifer, water levels from the well may represent a worthless composite head of heads in the unconfined aquifer and heads in the screened/packed interval of the confined aquifer. In addition, extensive screened and packed intervals may serve as preferential conduits for contamination between aquifers. The NRC staff recommends that the PSMP be revised to eliminate the ambiguity in well screen and gravel pack descriptions.

The descriptions of well screens in the PSMP appear to be overly detailed and too prescriptive. The descriptions of monitoring well requirements reads in places like a Statement of Work (SOW) for contractor installation of the wells. For example, this section prescribes that well screens will be 5 to 20 feet in length, will consist of PVC pipe having three rows of slots cut on 120° centers with 0.01 inch-wide slots being 0.25 inches apart, and will be commercially-slotted. The prescription is followed by a caveat that essentially states that all of the above description is subject to modification based on well-specific determinations. The caveat casts doubt on the need for the prescriptive description in the PSMP.

NRC staff recommends that where decisions will be site-specific, or well-specific in the case of monitoring wells, that the PSMP should merely state the factors that will be considered in making decisions. This type of approach was presented in the plan in the description of factors that will be considered in selecting the length of screened intervals in wells.

Section 2.7.2, Pg. 20

The borehole log form (Figure 2.8) appears to be an inefficient form for communicating and recording borehole logs. Standard borehole logs that provide a graphical representation of the units penetrated by boreholes are easier to read and in a glance can provide a rapid summary of the lithologies or sediment types encountered in borehole. Examples of such logs have been prepared at several UMTRAP sites, including the logs prepared by Dames and Moore at the South Salt Lake UMTRAP site or the logs by Bendix at the Durango UMTRAP site. If DOE decides to include examples of borehole log forms in the PSMP, the NRC staff recommends that Figure 2.8 be revised to increase the form's efficiency in recording and communicating information (see examples attached).

Section 3.3.1, Pg. 30

The PSMP states that site inspection teams will be composed of a civil engineer and a soil scientist if only two inspectors are assigned to an inspection, yet

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the basis for selection of these qualifications is not apparent in the plan. The next sentence in the plan states that this team will be trained in the collection of groundwater samples and water level measurements. It does not appear, however, that civil engineers and soil scientists are qualified to make decisions regarding modifications to sampling procedures that are frequently necessary in the field. Similarly, a civil engineer may not be qualified to make critical observations of stream encroachment at a site. NRC staff recommends that the qualifications of site inspectors be determined based on the types of surveillance and maintenance activities to be performed at a particular site. For example, if groundwater samples will be collected at a site, the inspection team should consist of at least one hydrogeologist or hydrochemist who is qualified to collect, preserve, and transport the water quality samples.

Section 3.3.1, Pg.31

This section includes a list of items to be reviewed by the site inspection team for the purpose of becoming familiar with a site. This list should also include surface and near-surface geological/geomorphic features and processes.

Section 4.0, Pg. 41

Section 1.1 states that the decision to monitor groundwater at UMTRAP sites will be determined by the criteria provided by the PSMP. Section 4.1, however, does not provide criteria to make such a decision and does not specify the party making this decision.

Section 4.1 provides a list of factors for consideration in determining the need for and extent of post-remedial action groundwater monitoring. To transform these factors into criteria, each would have to be rewritten into a decisional statement. For example the consideration listed in the PSMP as "Background water quality of potential water supplies" would be rewritten into a question like "Would water resources potentially affected by the remedial actions be water supplies based on their background qualities?". The PSMP does not provide these criteria and, therefore, cannot be used to determine the need for and extent of groundwater monitoring programs.

If the plan did provide criteria to make a decision, the party responsible for making the decision using the criteria would have to be specified. Under UMTRCA, the NRC will license the UMTRAP sites and require such monitoring, maintenance, and emergency measures that it determines necessary to protect the public health and safety and the environment. Thus NRC would be the appropriate party to determine the need for and extent of groundwater monitoring programs required at UMTRAP sites. It appears that the PSMP is

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premature in describing procedures to verify compliance with licensing requirements that have not been specified and that will be determined on a site-specific basis at the time of site licensing. At that time, the NRC will decide about the need for and extent of groundwater monitoring programs required to protect the public health and safety and the environment.

Section 4.2, Pg. 44

The PSMP states that background and baseline groundwater monitoring programs will sample each well quarterly for one year and determine the concentrations of constituents listed in Table 4.1. This list is comprehensive and adequate to represent anticipated contaminants from uranium mill tailings.

The set of detection monitoring constituents is more limited and includes such constituents as uranium, total dissolved solids, and the major cations and anions. Because of high concentrations of nitrate reported in tailings solutions, the use of nitrogen-containing-compounds in uranium milling circuits, and the relative mobility of nitrate in groundwater systems, NRC staff recommends that nitrate be added to the list of detection constituents. The suite of detection constituents may also be selected on a site-specific basis in the site license based on the results of site characterization prior to remedial actions and the results of background and baseline evaluations.

Continued monitoring and surveillance of UMTRAP sites may generate large quantities of groundwater-quality data. The PSMP does not describe how this information will be efficiently stored for rapid retrieval and review. Prior to the initiation of post-remedial action monitoring, DOE should consider establishing a data management system to control the data and facilitate evaluations of the water quality data, as well as other data collected at UMTRAP sites.

Section 4.2, Pg. 52

The PSMP states that background and baseline soil and rock chemical quality will be assessed to determine the concentration of water soluble contaminants remaining in the soil or rock. However, the plan does not mention the purpose for determining this information. The NRC staff agrees with DOE that the chemical quality of sediments and rock may be useful in interpreting groundwater quality data or in characterizing the relative attenuative capacity of hydrogeologic units that may transmit contaminated groundwater. For example, such information may aid investigators in explaining seasonal variations in the quality of shallow groundwater. NRC staff recommends that the PSMP be revised to describe potential uses of the baseline and background chemical quality data in interpreting groundwater monitoring programs.

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Similarly, the plan states that baseline well hydraulics will be identified by analyzing the results of three independent slug tests in each monitoring well, yet the plan does not describe the purpose for characterizing well hydraulics. NRC staff recommends that the PSMP be revised to describe the purpose for identifying and characterizing well hydraulics and how these characterizations may be used in developing groundwater monitoring programs and interpreting the results generated by the programs.

Sections 4.3-4.5, Pg. 52

The PSMP describes a phased approach for groundwater monitoring at UMTRAP sites, where monitoring and mitigative action, if needed, is increased after significant contamination is detected. As currently described, however, the plan is incomplete and does not provide for early consultation between the responsible agency and NRC. For example, the plan states that a report will be prepared and submitted to NRC upon completion of compliance monitoring, yet the plan does not stipulate criteria to judge the completion of compliance monitoring. If compliance monitoring continues during the performance of mitigative measures, contact with NRC may occur years after the excursion is detected and mitigative action executed. The NRC staff recommends that the PSMP be revised to improve the clarity and comprehensiveness of the plan and provide for earlier coordination with NRC with respect to groundwater contamination.

Although specific requirements for groundwater monitoring will be established in the site license, the NRC staff recommends that DOE consider revising the PSMP to be generally consistent with the monitoring protocol outlined below:

1. Responsible agency initiates detection monitoring and reports results and interpretations annually to the NRC.
2. Upon the occurrence of an excursion, the responsible agency notifies the NRC and immediately retests for an excursion.
3. If the retest confirms the excursion, the responsible agency notifies NRC of the confirmed excursion and begins compliance monitoring by submitting a preliminary assessment of the excursion and plan for additional monitoring, or

If the retest indicates that the excursion did not occur (even for different constituents), the responsible agency resumes detection monitoring.

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4. Responsible agency obtains approval of NRC on plan for compliance monitoring and executes plan, which may have been previously approved by NRC and held on standby.
5. Once the compliance monitoring program is operational, the responsible agency submits to NRC a hydrogeologic analysis of the initial monitoring results and recommends appropriate mitigative actions to protect the public health and environment.
6. The responsible agency continues compliance monitoring for the duration of the excursion. After two consecutive years without excursions of any constituents, the responsible agency may resume detection monitoring in consultation with NRC.

This type of phased monitoring approach is generally consistent with the program described in the PSMP. It differs from the PSMP's program, however, in the immediate retesting of excursions prior to initiating compliance monitoring, in requiring submission of plans for compliance monitoring, in requiring submission of hydrogeologic analyses during compliance monitoring to interpret the monitoring results and recommend appropriate actions, and in facilitating ongoing consultation between the responsible agency and NRC during excursions.

Consultation with NRC about other types of violations of site performance, such as by earthquakes or landslides, could also be treated in a similar manner.

Section 4.4, Pg. 52

The PSMP describes statistical procedures for the analysis of groundwater quality data. However, these descriptions do not explicitly describe critical procedures in the statistical manipulation of the data. For example, the plan does not specify the population of concentrations that will be used to calculate mean concentrations, specifically whether the mean concentration will be determined for each sampling event or for all sampling events in a given sampling year. Averaging concentrations across an entire year may mask important trends in concentration and promote possible determinations of false positive and negative findings with respect to outliers. The plan does not describe how concentrations of split samples will be compared and considered in the statistical analyses or how laboratory performance on standard and blank samples will be considered, perhaps by preferentially weighting the concentrations. The NRC staff recommends that the PSMP be revised to describe explicitly the statistical procedures that will be used to evaluate and compare groundwater monitoring data.

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In addition, the bars indicating sampled mean concentrations were omitted from the equations to determine outliers.

Section 4.5, Pg. 56

The PSMP defines an excursion as a measured concentration at a downgradient well for one of the detection constituents that is equal to or greater than the mean concentration plus two standard deviations. It appears from the definition of outliers in Section 4.4, however, that most concentrations qualifying as excursions will be discarded as outlier concentrations. In addition, the definition of excursions as concentrations greater than or equal to two standard deviations above mean concentrations may not be an appropriate threshold to precipitate compliance monitoring and mitigative actions. Further, the plan does not describe how concentrations determined in samples collected from upgradient wells will be compared with downgradient concentrations and what action would be taken if an excursion is detected in an upgradient well.

Depending on site-specific factors such as hydrogeology, local water use, statistical distribution of contaminant concentrations, and the constituent, a two standard deviation increase in the concentration of the constituent may pose an unacceptable risk to downgradient consumers of groundwater. Consequently, a generic definition of excursion may not be appropriate for inclusion in the PSMP; definitions of excursions may more appropriately be defined in site-specific licenses. NRC staff recommends that the PSMP be revised to support the current definition of excursion or to indicate that excursion criteria will be established in site licenses.

Increases of two standard deviations in the concentration of a constituent in a downgradient well compared with the mean concentration of the same constituent in an upgradient well may indicate that the stabilized tailings are significantly degrading the quality of groundwater beneath a site. Such degradation may require mitigation to protect humans and the environment. The current version of the PSMP does not describe procedures that will be used to compare upgradient and downgradient concentrations, thus suggesting that upgradient water quality monitoring is unnecessary. Upgradient sampling is necessary, however, to monitor the increase in concentration of constituents contributed by the stabilized tailings. In addition, upgradient groundwater quality may significantly change in response to natural and artificial influences. These changes may appear as excursions in downgradient monitoring wells if they are not monitored in upgradient wells, which would artificially trigger compliance monitoring. NRC staff recommends that the PSMP be revised to describe procedures for the comparison of upgradient and downgradient constituent concentrations.

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Table 5.1, Pg. 59

This section specifies that aerial photographic coverage will extend 0.25 miles beyond the site boundaries. Although this distance is only provided as guidance, it seems to be a very limited distance without a rationale. Features and processes such as faults and drainage modifications could impact the stability of the tailings from distances greater than 0.25 miles. NRC staff recommends that the PSMP be revised to stipulate aerial photographic coverage beyond 0.25 miles or to justify the 0.25 mile guidance.

Table 5.3.1, Pg. 63

This table lists features to be identified from analyses of air photos. Although wind erosion blow-outs are listed, wind depositional features are omitted. Wind deposition features should also be included because such deposition could change drainage patterns. Also, included should be ground fractures and faults and soil/rock mass movements (e.g., landslides and subsidence) because of the potential for destabilizing the tailings embankments.

Section 6.2, Pg. 65

The PSMP adequately defines those design features of a remedial action plan which need to be monitored and maintained. However, the plan omits action levels at which maintenance will be performed on any particular design feature. Without clear definition of action levels, it may be difficult to judge if the integrity or efficiency of a particular design feature has been seriously impaired and should be immediately fixed.

For example, suppose that three inches of sediment has accumulated in a drainage ditch. It may be very easy to conclude that this amount of sediment accumulation does not significantly affect the capacity of the diversion ditch and does not require immediate action. But, suppose the accumulation is 12 inches, or 24 inches, or 36 inches; in such cases, depending on the size of the ditch, the capacity of the ditch may be significantly impaired. In this case, the need for maintenance needs to be clearly defined at a specific level of sediment accumulation.

Recognizing that the need for maintenance should be based on engineering judgment (depending on the site-specific design), it is nevertheless important that generic action levels be established to determine if design features should be repaired and/or maintained. Without such criteria, consistency from site to site will be difficult. These action levels should be provided and discussed in the PSMP.

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A method should also be established for documenting the long-term degradation of non-durable rock. The method should be able to account for fracturing, decrease in rock size, and any overall reduction in durability of either individual rocks or the total rock layer. The method should be discussed in the PSMP.

Table 6.3, Pg. 67

This table suggests the placement of inclinometers or tilt meters as part of custodial maintenance or repair actions that could be needed at sites with unstable slopes. These types of instruments could be installed earlier as surveillance features (see pg. 7).

As recognized on p. 35, slope creep is subtle and may be difficult to observe. In many cases it is easier, less expensive, and more efficient to install items like inclinometers during remedial action work. This would allow baseline data to be established for comparison over a longer period of time and could detect problems early, before any problems became more difficult and expensive to correct.

Details of slope stability surveillance instrumentation could be determined on a site-specific basis. However, NRC recommends that the PSMP be revised to include installation of slope stability surveillance instrumentation at all sites.

Glossary, Pg. 79

The term "hydraulic gradient" is incorrectly defined. The PSMP should be revised to define the term correctly as the change of static head (including elevation head and pressure head) per unit distance in a given direction [cf. "Glossary," Permeability and Groundwater Contaminant Transport, ASTM STP-746].

Appendix B

The PSMP does not provide a plan to perform a follow-up literature searches for information that might impact earlier geomorphic, natural resource, or seismic evaluations. New faults or evidence of fault activity near a site might be found or geomorphic processes not previously thought likely in a given area may have occurred. Plate tectonics and studies of large scale/small scale movements in the mantle are rapidly developing areas of geologic knowledge that could impact seismic evaluations. Natural resource exploration often yields information not only about resource potential but also about structural geology. Additional monitoring of seismic recordings might reveal previously

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undetected active faults. NRC staff recommends that a geoscience literature search be conducted and the results evaluated and documented at the end of the initial 10-year surveillance period. Further, geoscience literature searches will likely be necessary beyond the initial surveillance period.

Section B.6, Pg. B-15

Potential processes that may cause cracks to develop are detailed in this section, but 1) vibratory ground motion and 2) fault displacement are not included. These two processes should also be included because they may cause cracks to develop, which may promote erosion.

Appendix D

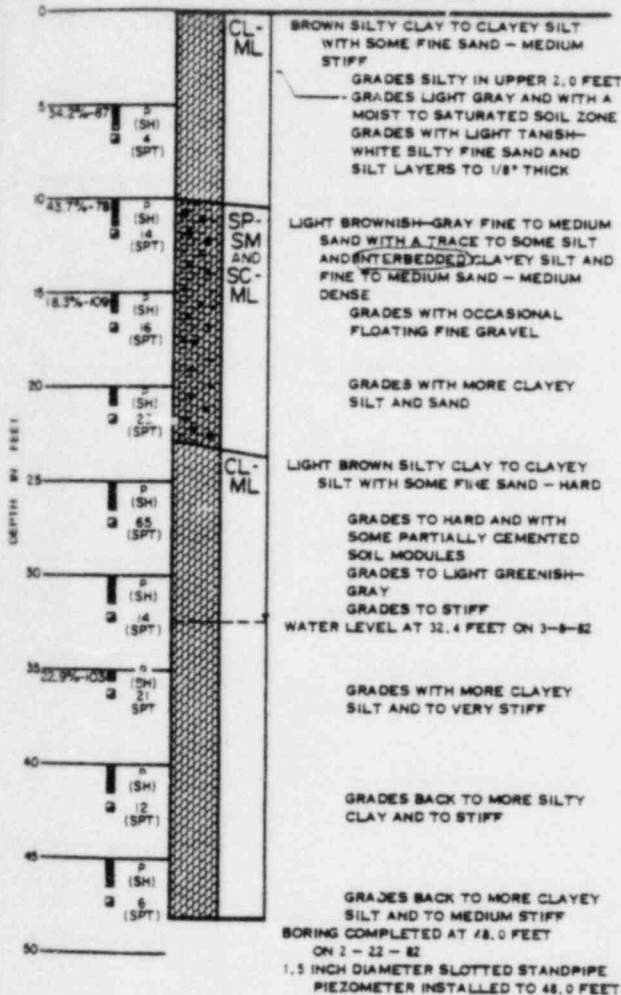
The field procedures described in Appendix D are identical to those previously reviewed by NRC staff with respect to groundwater evaluations at the Shiprock site. Comments on the field procedures were documented in a memorandum from M. Knapp to L. Higginbotham dated April 9, 1985. Because the field procedures have not been revised since their earlier review, the April 9 comments also apply to Appendix D.

Section D.5, Pg. D-17

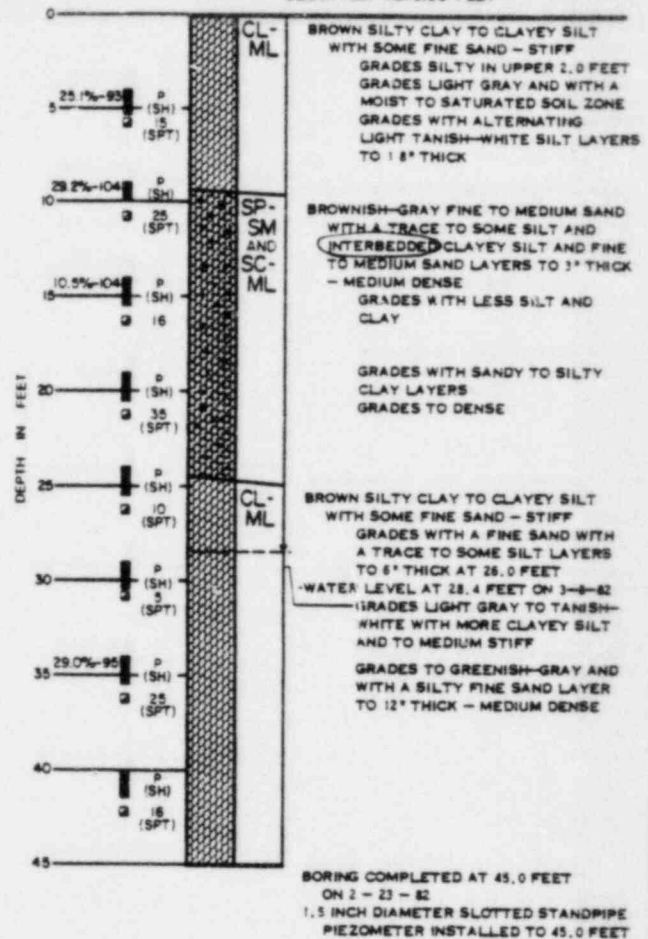
Section D.5 refers to Section D.4.1 for descriptions of accuracy criteria for water quality analyses, yet these criteria are described in Section D.5.1. This inconsistency should be corrected.

ATTACHMENT
EXAMPLE BOREHOLE LOGS
(from DOE/EIS-0099-D)

BORING SC-10 COORDINATES N 15007.0
E 23429.5
ELEVATION +280.0± FEET



BORING SC-11 COORDINATES N 14941.8
E 21789.6
ELEVATION +276.0± FEET



KEY

- A - B C
D
- A FIELD MOISTURE EXPRESSED AS A PERCENTAGE OF THE DRY WEIGHT OF SOIL
B DRY DENSITY EXPRESSED IN LBS. PER CUBIC FOOT
C BLOWS PER FOOT OF PENETRATION USING A 140 LB. HAMMER DROPPING 30 INCHES
P PUSHED SAMPLER WAS ADVANCED HYDRAULICALLY
D TYPES OF SAMPLER
(P) - PISTON SAMPLER
(PT) - PITCHER SAMPLER
(SH) - SHELBY SAMPLER
(SPT) - STANDARD PENETRATION TEST
(U) - DAMES & MOORE SAMPLER WITH
" U" TYPE DRIVE SHOE
(D) - DAMES & MOORE SAMPLER WITH
" D" TYPE DRIVE SHOE
B DEPTH AT WHICH UNDISTURBED SAMPLE WAS EXTRACTED
Q STANDARD PENETRATION TEST