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Date: May 8, 1995

Subject: OU4 Solar Evaporation Ponds IM/IRA

Purpose: Minutes of May 5, 1995, meeting between members of the E.G. & G. and Parsons Engineering project teams concerning the current status of the subject project.

Discussion: A meeting was held at 8:00 A.M., May 5, 1995, between members of the OU4 Solar Evaporation Pond IM/IRA project teams from E.G. & G. and Parsons Engineering. Those in attendance were:

E.G & G:

Tim Kramer, Project Manager
George P. Timinskas, Project Engineer
Ralph Anhold, Construction Management

Parsons Engineering:

Phillip Nixon, Project Manager
Sandy Stenseng, Civil Engineer
Daniel Creek, Geo-Technical Engineer

The purpose of this meeting was twofold; to provide a briefing to the incoming E.G. & G. Project Engineer, George P. Timinskas, on the history and current status of the project, and to resolve a number of design concerns Mr. Timinskas uncovered during his initial review of the 60% design documents.

Mr. Nixon presented the project history including the evolution of the design of the 1,000 year containment cap and underdrain system. The containment cap design was essentially a copy of a similar 1,000 year capping system researched and developed to contain buried hazardous wastes at the U.S. Department of Energy's Hanford, Washington, site. Mr. Timinskas' review of this design revealed six areas of concern which are presented as comments below with their resolution. Discussion within the Group, and in particular, input from Sandy Stenseng, eliminated many of these concerns, however, one or two persist which require additional input or research as indicated.

Comment 1:

The only hydraulic barrier present in the cap design is a 6 inch thick asphalt concrete (A.C) pavement with gravel sub-base, laid directly on the contaminated media and over-laid by a 200 MIL rubberized asphalt membrane. VLEACH calculations prepared by Parsons confirm that in the absence of this hydraulic barrier water would percolate through the soil cap, through the underlying contaminated media and into the underdrain system for eventual release into the environment. The A.C. pavement and membrane are not natural materials, are subject to degradation from many sources and cannot be expected to last 1,000 years. A 10-11 acre slab of asphalt concrete, even though buried, would be subject to overall thermal stresses present in the cap and settlement stresses from a subgrade of contaminated material which will begin to settle immediately and will continue to settle for a period of 400 years or more. Man-made asphalts, even though protected from freeze/thaw cycles and UV exposure, are still subject to aging and degradation from a number of sources including hydrolysis, oxidation and exposure to chemicals and gases from decomposition.

Resolution: From a standpoint of performance as a hydraulic barrier for a 1,000 year period, Parsons Engineering agrees that the asphalt pavement/membrane combination is the weak point in the engineered cap, but that it was adopted for use at Hanford and Rocky Flats in lieu of natural soil/clay caps which tend to dry-out and crack in semi-arid environments. Hanford was in the process of researching natural asphaltic materials which have survived for centuries and comparing the chemistry of these naturally occuring compounds to todays man-made asphalts for the purpose of determining their longevity. As it is imperative that the asphalt concrete pavement and membrane function as intended for the life of the cap, the following design modifications were proposed by Mr. Timinskas to help achieve this end:

1. To minimize settlement of the contaminated media which acts as a sub-grade under the asphalt pavement, increase the media compaction requirement from specified 90% to 95% minimum.
2. To minimize water and vapor intrusion into the asphalt concrete matrix, a prime cause of asphalt degradation, decrease the specified void ratio of 4% to 2% by either increasing asphalt cement content or degree of concrete compaction or both.
3. Instead of having one large slab of asphalt concrete pavement 6 inches thick, provide two 3 inch thicknesses sandwiching a stress absorbing membrane to minimize settlement/thermal/aging cracks through the entire pavement thickness, a prime cause of pavement and subsequent membrane deterioration.

The above modifications are applicable only if the asphalt cement itself, the binder for the asphalt concrete and membrane, will survive the 1,000 year period. Mr.Nixon will provide Mr. Timinskas with all evidence and literature he has on asphalt concrete and membrane durability. Mr. Timinskas will assimilate this information and will conduct an independent effort to obtain additional information on asphalt/asphalt membrane degradation, all of which will form the basis of his 90% design review.

Comment 2:

Why is there a huge mass of soil, approximately 6 feet thick, above the hydrauliic/biotic barrier? This soil may function as an evapo-transpiration zone to minimize water percolation through the cap during periods of good weather, but it will act as a saturation zone during periods of extended rainfall and snowmelt, thereby increasing surcharge on, and degradation of, the hydraulic barrier.

Resolution: Parsons feels that the benefits of a large evapo-transpiration zone, with room for needed capillary breaks, root intrusion, etc., will offset any potential determintal effects when the zone becomes saturated a few times a year. As for increased surcharge on the hydraulic barrier during saturated conditions, Parsons advised that drainage layers above the hydraulic barrier, at 5% cross-slope, will wick-away water before it can be concentrated against the barrier.

Comment 3:

Why is the biotic barrier placed so deep in the evapo-transpiration zone? Current practice is to place barriers nearer the surface to prevent animal/root intrusion into the underlying soil cap, intrusions which would create paths for additional water infiltration and gas venting.

Resolution: Parsons feels that the biotic barrier is placed correctly, both to protect the underlying asphalt membranes from biotic tampering and to provide a capillary break for the overlying finer-grained soils. They furthur advised that recent research has indicated that animal intrusion into the evapo-transpiration zone does not increase water infiltration and may in fact increase evapo-transpiration in the soil.

Comment 4:

There is no secondary containment liner beneath the contaminated media to prevent leachate from entering the underlying gravel drain and reaching the environment in the event of cap failure.

Resolution: Parsons feels that it is better not to have a secondary liner under the contaminated media to prevent " bath-tubbing" and concentration of leachate in the media above a liner. The leachate they are concerned with is the result of miniscule amounts of water leakage thru the hydraulic barrier and infiltration through the contaminated media. Parsons has not addressed the containment of large amounts of leachate generated from the contaminated media as a result of failure of the hydraulic barrier above the media as proposed in Comment 1.

Comment 5:

The geo-textile blankets surrounding the sand filters for the gravel underdrain are man-made materials which may, as recent research indicates, be subject to deterioration and clogging, thereby interfering with the operation of the gravel drain as intended.

Resolution: Parsons will furthur investigate the function of, and need for, the geo-textile blankets.

Comment 6:

Why all the extensive instrumentation? There is instrumentation in overlying soil zones where saturation will definitly occur and there is no reason to record it.

Resolution: Parsons agrees that there is too much instrumentation, but advised that the instrumentation is under a separate contract and that they have no control over it.

George P. Timinskas P.E.