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Internal Letter



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Rockwell International

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Subject Status of the BWIP Water Balance Study

Before a discussion of the status of the BWIP Water Balance may begin, it is necessary to define the structure and limits of such a study. It is the aim of this program to establish a data base which describes to the best of our knowledge water input and waste disposal in the 200 Areas. Present metering practices on radioactive waste streams are mostly adequate on paper. However, collection and dissemination of data from these meters is incomplete and haphazard. Non-radioactive streams are rarely metered and in fact are often ignored. It is our intent not only to develop a library of available flow data from scattered sources, but to collect in-field measurements or make studied estimates of those effluent streams which are unmonitored. In addition, historic flow data, such as activation and deactivation dates and flow totals, shall be collected from available records. The final product of this study will be a monthly report consolidating the past month's influent and effluent volumes, and a yearly report examining facility histories, including an historical water balance, metering methods, and a complete record of influent and effluent volumes for the year. This document will meet the requirements of not only the BWIP and the PNL modellers, but also those stated by personnel in Waste Management, Process Engineering, and Surveillance.

DATA COLLECTION FROM FACILITY SOURCES

Initially, all available information from 1983 was compiled and analyzed using yearly totals. "Radioactive Liquid Wastes Discharged to Ground in the the 200 Areas During 1983" (R. C. Aldrich) was used as a source for radioactive waste stream volumes. V. E. Winston supplied data from the 200 East and 200 West powerhouses, which included water supplied to the two major water lines and sanitary water and steam production in both areas. Using a water tree (Table 1), an attempt was made to reconcile volumes published in Aldrich's document with those from the powerhouses. As expected, most waste volumes were smaller than water volumes supplied; in one case only about 50% of the source volume was accounted for. However, volumes supplied to the PUREX raw water line were 43% smaller than those discharged. This is an indication of a genuine system problem: 4.5 x 10E9 L, or an average of nearly 2300 gpm, are either not accounted for in powerhouse records, or are being exaggerated in PUREX estimates. This amounts to nearly 25% of the total flow to 200 East. Surveillance personnel have noted for some time the possibility that flow volumes to Gable Mountain and B-Ponds may be less than PUREX records indicate. This would support Powerhouse records, thus pinpointing PUREX as the major source of error.

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To help avoid possible reporting inaccuracies, radioactive waste stream volumes are now collected directly from the facilities. Monthly figures have been collected for 1983 for nearly all waste streams through June. It has become evident that prompt compilation of monthly volumes will depend on cooperation from the plant facilities, and will perhaps require some funding to personnel collecting facility data.

Historical water balance data has not yet been examined. It is anticipated that discrepancies will be similar to those encountered in the 1983 data. Facility activation and deactivation dates will be noted carefully and completely.

IN-FIELD MEASUREMENTS AND ESTIMATES

As noted earlier, information on some waste streams is not available. Hydrogeology must collect all necessary information as a requirement for complete reporting of waste volumes. This includes monitoring or making studied estimates of flow volumes and infiltration in the 200 Areas surface ponds and cribs, the 200 Area Sanitary Tile Field systems, and evapotranspiration.

200 Areas Septic Tank and Sanitary Tile Fields Flow estimates to the various Sanitary Tile Fields has been completed. Estimates were based on a per capita water use of 125 L/day, or 235 L/day for shower takers. Population distribution and derived flow rates were taken from Rockwell Compensation records, telephone surveys, area maps and landlord information. This is the only known attempt to quantify flow to 200 Area septic systems.

Infiltration Rates Infiltration in the 200 Area ponds and cribs has been traditionally an unknown quantity. Because pond and crib inflow has been unmetered or poorly monitored, few infiltration estimates have been attempted. Crib design infiltration rates have been fixed at 10 gpd/ft² in the 200 Areas, with some exceptions, lacking any better information from existing facilities. Recent developments have made it possible to estimate infiltration rates in most cribs and ponds. Crib liquid levels are now being monitored on a weekly basis. The placement of Parshall flumes with continuous recorders in 216-B-3-3 ditch and more recently the Gable Mountain Pond pipeline, improves the reliability of inflow data to both Gable Pond and the B-Pond systems.

Infiltration studies of B-Pond and the first expansion pond were conducted in May and June. Since the installation of new outlet structures into the first expansion pond and the overflow into the second expansion, incomplete data collection has hindered infiltration studies. Most missing information is now available, but flow through the weir-gate assemblies may only be approximated since they are not calibrated.



Infiltration rates are being calculated for both expansion ponds, and early results indicate a steady drop.

Flow rate information in the Powerhouse Pond indicates the flow totalizer installed there has not been calibrated correctly. This problem must be resolved before infiltration rates may be computed.

With the introduction of a Parshall flume in the Gable Mountain Pond pipeline, satisfactory estimates of infiltration can be undertaken. The effects of decommissioning work on the pond system can also be studied.

Quick visual estimates of flow rates to S-10 were performed to approximate the infiltration capacity of the ditch. Such quick estimates of flow must not be considered a substitute for accurate and continuous monitoring. Flow measuring equipment is immediately available which will satisfy these needs at S-10, and it is recommended that actions be taken to monitor this waste stream.

Preliminary flow estimates to U-Pond were gathered from in-field measurements taken in April, 1984. It is necessary to monitor the flow from U-14 ditch to U-12 pond on a daily basis, not only to quantify flow but to examine the role of the ditch as a path for infiltration. Thus, it is recommended that monitoring systems be placed upstream and downstream on U-14 ditch. Upstream placement has been delayed due to design changes in the make-up water system. Downstream placement is possible now if funding is available.

As mentioned above, crib liquid levels are now being monitored on a weekly basis, thus making infiltration studies of existing cribs feasible. With careful monitoring of flow volumes to the active cribs, satisfactory estimates of infiltration rates will be possible. Experience dictates that compilation of flow data, and in fact the data collection itself, may require funding to appropriate personnel.

Evapotranspiration Evapotranspiration has been an issue of some controversy in the Hanford Area; it is not in the scope of this study to resolve this issue; instead, certain rules will be adopted and followed. Rainfall will be neglected. Evapotranspiration from sanitary tile fields will be estimated based on existing formulas such as the Penman equation or some equivalent, using values already determined in other 200 Area studies. Evaporation in the ponds is estimated using a graphical correlation (Hydrology for Engineers, Linsley, Kohler, Paulhus) of solar radiation, wind speed, dew point and temperature, and substituting values collected by the nearby meteorological station.



Other Investigations

Information on existing metering systems has been poorly disseminated. An update on all present metering systems of waste streams and waste stream source descriptions has been completed. An update of "Water Import and Waste Disposal Measurements in the 200 Areas of the Hanford Reservation" (Summers, 1975) is nearly complete. In addition, information of some unexplained waste discharges is being noted for later investigation.

DATA RECORDS

Present data is in hand written form on loose data sheets. A system will be inacted after discussion with QA personnel on appropriate format. The HP-9836 data base will be accessed for computer storage of data. D. A. Zimmerman, modeller from PNL, has indicated that monthly data entered directly on an area map would be most convenient for his purposes.

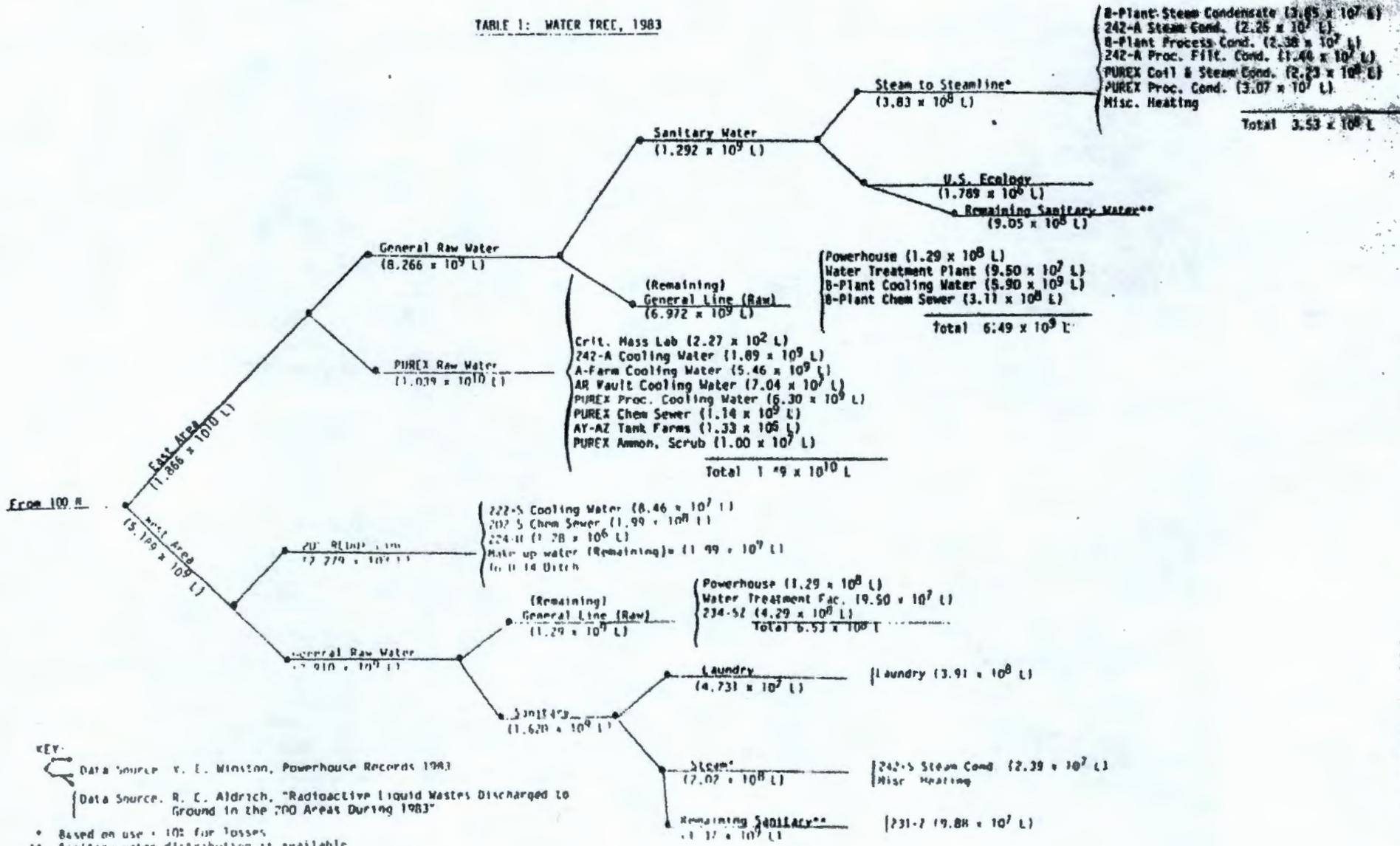
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TABLE 1: WATER TREE, 1983



KEY:
 Data Source: V. E. Winston, Powerhouse Records 1983
 Data Source: R. E. Aldrich, "Radioactive Liquid Wastes Discharged to Ground in the 200 Areas During 1983"
 * Based on use + 10% for losses
 ** Sanitary water distribution is available

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