AR TARGET SHEET

The following document was too large to scan as one unit, therefore, it has been broken down into sections.

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TITLE: Final EIS Disposal of Hanford Defense High-Level, Transuranic and Tank Wastes the soil type and on the economic limitations associated with long distances and the high lift necessary to move sufficient water to the plateau. According to B. J. Hajek (1966), most of the soils on the 200 Areas plateau were found to be Class IV, indicating that there were severe limitations for permanent cropland use. However, as part of the Barrier Development Program (Adams and Wing 1987), the barrier will be tested to failure with artificial irrigation. This would provide data on the degree of protection afforded by the protective barriers, even in the unlikely event that someone were to farm on top of the barrier.

3.5.3.2 Comment:

Reviewers observed that the calculated impacts are highly sensitive to water recharged into the system and that the range of soil infiltration values used in the impact assessment was only an order of magnitude (0.5 and 5 cm/yr) and therefore nonconservative. With the recharge rates at Hanford currently unknown, a range up to 15 or 20 cm/yr was suggested. It was further noted that these assumptions imply nonconservatively low soil moisture contents, slow radionuclide release rates, and slow radionuclide transport (Letter Numbers: 215, 223, 233, 243-EPA).

Response:

The infiltration rates used in the EIS are average annual recharge rates based on professional judgment and not data. Because the average annual precipitation is 16 cm/yr, there is no reason to believe that the average annual recharge would be 15 to 20 cm/yr. The research program described under the preferred alternative is intended to resolve these questions of average annual recharge rates and soil moistures and provide the data with which to refine these calculations. However, the DOE believes that the analysis which has been done is adequate for the level of decision making called for in the draft EIS.

3.5.3.3 Comment:

One reviewer stated that it was not clear what insight is gained by varying the amount of recharge when it is assumed that the barrier completely prevents any infiltration from contacting the waste (Letter Number: 215).

Response:

Movement of radionuclides is modeled for lateral diffusion from underneath the barrier to where it could be contacted by advecting water. It is that water (and its rate of recharge) that governs the transport of radionuclides in the groundwater once diffusion has transported them away from the protection of the barrier. Moreover, the higher recharge value was used in conjunction with postulated barrier failure scenarios.

Contamination Potential

3.5.3.4 Comment:

Several reviewers commented on migration of contaminants away from reverse wells and tank leaks, pointing out that the characterization of that migration could add to the understanding and modeling of the Hanford Site aquifers.

Some reviewers questioned the draft EIS statement that there has been limited radionuclide migration from reverse well 216-B-5. One reviewer felt that it would be useful to know to what depth contaminants may have penetrated the basalts at the base of the unconfined aquifer, noting that Hanford researchers (Brauer et al. 1974) found iodine-129 in what was believed to be a confined aquifer. It was suggested that additional in situ characterization is needed to support modeling of contaminant transport.

One reviewer said it would have been instructive to show both the 1973 and 1979 distribution of contaminants for the 241-T-106 tank leak and any more recent distribution. The reviewer felt that plans to continue monitoring movement of these leaks should be discussed.

Another reviewer suggested that data on lateral migration of contamination away from 216-A-24 would be beneficial in showing that there can be significant lateral migration of contamination away from the actual disposal site (Letter Numbers: 215, 223, 239-NRC, 243-EPA).

Response:

Groundwater has been monitored around the 216-B-5 reverse well. None of the long-lived isotopes have been detected beyond the immediate area. Note that the "confined " aquifer referred to by the reviewer is not a basalt confined aquifer but rather the lower and basal unit of the Ringold within the "unconfined sequence" overlying the basalt aquifers. The DOE agrees that additional in situ characterization studies would be beneficial in support of contaminant transport models.

The 1973 and 1978 distributions for 241-T-106 have been shown in Figures V.22 and V.23 of the draft EIS. As presented on page V.32, the maximum depth of radionuclide penetration was 27 m and 33 m, respectively, for the years 1973 and 1978. No additional summarized data are currently available.

While interesting and useful as suggested, the additional data would not enhance the comparison of the impacts of the alternatives.

3.5.3.5 Comment:

One reviewer commented that no information is provided to support the claim (page V.14) that "...acidic uranium contamination could not have reached the groundwater without some type of man-made disturbance." Also noted was the fact that the waste fluid was acidic, which would probably allow for dissolution of the caliche layer. Referring to the horizontal transport of the uranium contamination along the caliche layer, another reviewer noted that this unexpectedly high-velocity horizontal contaminant movement, due to site stratigraphic characteristics, followed by rapid vertical transport around a well casing (due to poor construction methods) is representative of the kind of complication that can render modeling efforts meaningless (Letter Numbers: 215, 243-EPA).

Response:

The comment regarding the need for "man-made disturbance" to effect the uranium reaching groundwater probably arose from the statement: "This rapid movement of water to the water table could not occur in an undisturbed environment." The statement has been removed from the final EIS. DOE disagrees with the contention that modeling efforts are rendered meaningless by events such as the cited contamination of groundwater by uranium. In most cases, the modeling provides meaningful and helpful if not precise prediction capabilities. Even in complex cases, modeling can be effectively applied given adequate geohydrologic data. With respect to the well casing, it was stated in the EIS that it was not grouted, which does not necessarily equate to poor construction methods.

3.5.3.6 Comment:

Several reviewers mentioned the potential effect of buried stream channels for radionuclide transport; some reviewers referred to a report by SEARCH Technical Services that intended to prove the existence of a buried channel going from the 200 Area to the Columbia River and suggested that the report be referenced in the EIS. The effect of this alleged channel was that groundwater travel time from PUREX would be reduced to 3 to 5 years rather than the much longer computer model estimates by PNL. Reviewers further stated that government studies going back to the 1960s confirm the existence of such a channel. Reviewers also asked for a discussion of groundwater flow velocities or travel times from the 200 Areas. One reviewer noted that groundwater velocity in the 200 West Area is approximately 1 m/day (corresponding to a travel time to the Columbia River of 80 to 100 years) to approximately 27 m/day (travel time to the Columbia River of 30 years) (Letter Numbers: 97, 152, 155, 164, 201, 202, 206, 214, 215, 219, 223, 243-EPA).

Response:

Paleogeomorphic channels do exist in the Ringold Formation that are filled with Pasco gravels (Hanford Formation), which have higher hydraulic conductivity (permeability) than the adjacent sands, silts and clays of the Ringold Formation. As noted, Hanford scientists have known about, studied, and measured the characteristics of such zones since the 1960s. These high-permeability zones are included in the Hanford Site groundwater models and account for the observed (from monitoring data) and modeled, movement of groundwater and nonreactive contaminants (e.g., tritium and nitrate). This relatively rapid flow in the unconfined aquifer moves in an easterly to southeasterly direction from the 200 East Area to the Columbia River. The current water flow is a combination of 1) the water percolating to the aquifer from the discharge of liquid wastes and cooling waters (artificial recharge of about 5000 cm/yr) in the 200 Areas, and 2) the natural recharge to the aquifer (primarily to the west). In the draft EIS, it was assumed that the artificial recharge from the liquid wastes and cooling waters had ceased. Therefore, the flow of water to the Columbia today is assumed to be greater than after the Hanford liquid discharges stop. These estimates of recharge (artificial and natural) are based on measurements of discharges of liquids in the 200 Area and calculations of natural recharge made by the U.S. Geological Survey (USGS) and PNL. Data collected on the Hanford Site by DOE contractors and independent researchers do not support the presence of a single, continuous, narrow channel such as that described by SEARCH.

Transport times of wastes from their location in the 200 Areas to the Columbia River are governed primarily by transport through the vadose zone. At the postulated higher natural recharge rate, i.e., 5 cm/yr, this results in transport times from the 200 Area waste locations to the Columbia River ranging from hundreds to thousands of years depending on the particular location and upon whether or not barriers are in place and functioning. In comparison to travel time in the vadose zone, travel time in the aquifer is relatively unimportant in the impact calculations. It allows for slightly more or less radioactive decay, which is of little consequence for the long-lived radionuclides being disposed of.

Differences in groundwater velocities (due to different hydrologic properties of the saturated sediments) are considered in the EIS. However, the relevant groundwater velocities are those in a post-Hanford water table, not the current groundwater velocities referenced in the comment.

The current water flow rate beneath the 200 Areas is about 0.9 m^3/sec. The water flow rate assumed in the EIS for the postulated higher recharge rate (5 cm/yr) was 0.4 m^3/sec. The EIS value also assumes that there is no artificial recharge of the aquifer. The calculated travel time from beneath the 200 Areas to the Columbia River is determined by the transport model and depends upon the species, chemical element or radionuclide, under consideration. The travel time of water in the aquifer is short compared to the travel time through the vadose zone.

3.5.3.7 Comment:

A reviewer noted that wastes must be disposed of without risking radionuclide movement to the water table through well bores and wanted to know if exact locations of all wells ever drilled on the Hanford Site are known (Letter Number: 171).

Response:

The DOE and its predecessors have promoted an aggressive well location and monitoring program since the project started in 1943. At the present time, Hanford wells are located to a longitude/latitude accuracy of ±1 ft and to a casing elevation accuracy of ±1/100 ft. All wells, approximately 3000 (dry and groundwater), are located and monitored periodically (McGhan, Mitchell and Argo 1985).

3.5.3.8 Comment:

A reviewer commented that the cumulative effect of past releases of iodine-129 in groundwater raised the activity level above background and that this level must be determined. Any cumulative effects from future iodine-129 releases in groundwater also must be determined and added to the previous total. The sum must not exceed the EPA standards for iodine-129 in groundwater (Letter Number: 171).

Response:

The EPA's National Primary Drinking Water Regulations 40 CFR 141 lists 1 pCi iodine-129/L as the concentration of iodine-129 leading to a dose equivalent of 4 mrem/yr dose limit for public drinking water systems. The iodine-129 value above background alluded to is probably that for borehole DB-7 near the horn of the Yakima River, for which a concentration of 3×10^{-4} pCi iodine-129/L was reported. The source of the iodine-129 has not been determined, but such a concentration would be less than 1/1,000 of the EPA limit for that nuclide in public drinking water.

3.5.3.9 Comment:

Several questions were asked concerning the effectiveness of the vadose zone to protect against radionuclide and chemical contaminant gravitational or other migration to the groundwater. Concern was also expressed about what monitoring activities or studies were being conducted to determine migration rates; specifically, what would keep the tritium plume below the single-shell tanks from leaking into the aquifer (Letter Numbers: 44, 201, 214, 215, 217, 223).

Response:

The tritium reported in the annual report (Price 1986) comes primarily from liquids discharged to cribs, and will eventually move downward under gravitational (and perhaps potentiometric) forces. Transport toward the groundwater may be accelerated under adverse circumstances such as high recharge. This EIS specifically evaluates impacts from scenarios where contaminants are leached from the waste and transported through the vadose zone to the aquifer and on to the Columbia River. Tritium has not been a major constituent in past leaks, nor is it a large part of single-shell tank contents. However, tritium is readily transported by water in soil and the aquifer. The purpose of the barrier described in the EIS is to exclude or minimize the flow of water through the waste sites and thereby reduce the likelihood of contaminants entering the groundwater.

Development and evaluation planned to enhance the understanding of contaminant migration, both radionuclide and chemical, is briefly described in the Interim Hanford Waste Management Technology Plan (DOE 1986e).

3.5.3.10 Comment:

The draft EIS states that calculated water contaminant concentrations change relatively little from the point of contaminant entry to downstream locations. A reviewer felt that this statement contradicted previous discussions that suggest considerable retardation of radionuclides during transport (Letter Number: 215).

Response:

In general, for the time periods analyzed, retardation of radionuclides occurs primarily in the unsaturated zone above the aquifer, and only the more mobile contaminants are transported as far as the aquifer.

3.5.3.11 Comment:

A number of reviewers expressed concern about existing radionuclide contamination in the Hanford unconfined and confined groundwater and the potential for contamination of drinking water supplies by future or present groundwater contamination. Reviewers noted that Hanford Site groundwater and discharges (including springs) into the Columbia River already exceed EPA drinking water standards, a fact that should be included in the EIS (Letter Numbers: 16, 55, 174, 201, 214, 215, 219, 233).

Response:

The purpose of the defense waste disposal alternatives set forth in this EIS is to minimize the potential impacts from the high-level, transuranic and tank wastes while balancing costs and benefits to the extent possible. The assessment presented indicates that the disposal action can be taken with minimal impact on the environment, including public drinking water supplies. However, access to some portions of the Hanford Site (including groundwater) would have to be restricted, both for the defense waste disposal alternatives and as a result of current groundwater contamination.

The existing unconfined aquifer contamination has been monitored and the impacts assessed as part of the routine environmental monitoring program. The EIS indicates results of this program, which show that the impacts to the environment are nearly nonexistent and represent only a small fraction of applicable offsite dose standards. Discussion of known contamination in the upper confined aquifer is presented in the EIS.

The EPA drinking water standards apply to a multiple-user "public water system." Neither the Hanford Site groundwater nor discharges to the Columbia River, including the riverbank springs, constitute a "public water system" and therefore those standards are not applicable.

3.5.3.12 Comment:

A reviewer suggested that the draft EIS statement that present storage of Hanford defense wastes poses no danger to the general public (p. 1.5) should be changed to reflect the fact that current releases to the Columbia River exceed allowable release levels established by Environmental Protection Agency (EPA) standards. The reviewer also requested a current data listing for all radionuclides and hazardous chemicals entering the Columbia River and the air (Letter Number: 233).

Response:

No applicable EPA standards are being exceeded by releases into the Columbia River, as documented in annual reports (Price 1986). The additional data requested would not enhance the comparison of defense waste disposal alternatives presented in this EIS.

3.5.3.13 Comment:

A reviewer commented that the draft EIS may have underestimated the amount of contaminated groundwater available for use by multiple small farms by integrating only the water flow toward the east (across a north-south line between Gable Mountain and Rattlesnake Mountain) and therefore may have underestimated the impacts. Water flow to the north should also have been included. Water for irrigation purposes could come from areas closer than 5 km from the waste sites (Letter Number: 215).

Response:

The multiple-small-farm scenario for 0.5-cm/yr recharge incorrectly referenced Figure Q.3, which shows northerly flow for 5-cm/yr recharge. The reference for flow direction should have been Figure Q.1, which indicates that the predominant flow is eastward. The contamination released from the defense waste disposal sites is mixed in this flow. Water is withdrawn at the edge of the "controlled area," 5 km from the waste site, as indicated in 40 CFR 191.12(g). In the scenario, the entire crop production is consumed by the local farmers and their families, maximizing the individual doses. The population dose would be the same if more individuals ate smaller amounts of the crop.

3.5.3.14 Comment:

One reviewer questioned whether the surficial unconfined aquifer and underlying confined aquifers are hydrologically isolated and whether there is contaminant transport between them, considering that the EIS points to known physical interconnection. A reviewer noted that the implications for contaminant transport were not included. Reviewers specifically mentioned contamination in the confined aquifer near the Yakima River (Letter Numbers: 215, 239-NRC, 243-EPA).

Response:

There was no intent to imply total hydrologic isolation or exclusion of contaminants. The qualifying words in the text are "relatively" isolated (0.2) and "seems negligible" (0.6). The text on page 0.6 has been revised in the final EIS.

In the West Lake-Gable Mountain Pond area, the basalts were uplifted along the eastern extension of the Umtanum Ridge-Gable Mountain structure and then eroded by postglacial floodwaters and the ancestral Columbia River. Hydraulic intercommunication now exists between the upper confined and unconfined aquifers in this area. Because cooling waters from chemical processing plants are discharged into ponds near the 200 East Area on the Hanford Site, hydraulic heads in the unconfined aquifer near these discharge areas have at times exceeded those in the shallow basalts. This created a hydraulic driving force for transporting low-level contaminated water from the unconfined aquifer into the uppermost basalt aquifer(s) (Gephart et al. 1976; Graham, Last and Fecht 1984). Contaminants in the upper, confined aquifer in the vicinity of the 200 Areas will discharge back to the unconfined aquifer near West Lake. Of course, any interchange of water will lengthen flow paths and increase travel times; thus, the modeling approach in treating the confined hydrologic systems as isolated from the unconfined aquifer is not only convenient but realistic and conservative.

At borehole DB-7, near the horn of the Yakima River, iodine-129 in the Mabton interbed was detected at concentrations of approximately 3×10^{-4} pCi/L. This concentration appears higher than at other groundwater sampling points away from waste disposal areas. However, data given in Early et al. (1985) show the absence of tritium (less than 0.1 tritium unit) in any wells monitoring the Mabton interbed outside the 200 Areas, including borehole DB-7. This implies that the source of slightly elevated iodine-129 concentrations in borehole DB-7 could not be the result of aquifer transport originating from either precipitation or subsurface movement from radioactive liquid waste-disposal sites farther north. The source of iodine-129 in borehole DB-7 is unknown. Studies are under way to examine the sampling procedure for borehole DB-7, which may influence the quality of water samples taken. See also Section 4.4.2.1 of Volume 1 for an additional discussion of iodine-129. For a recent summary of data on iodine-129 in Hanford groundwater, also see DOE (1987b).

See also comment 3.5.3.15.

3.5.3.15 Comment:

A reviewer noted that the contention that the interface below the unconfined aquifer is impermeable is an inference only and asked for detailed evidence (Letter Number: 243-EPA).

Response:

The impermeability of the interface below the unconfined aquifer is a conservative assumption (in the context of transport of contaminants) in that it minimizes the travel time in the saturated aquifer.

See also comment 3.5.3.14.

3.5.3.16 Comment:

Reviewers asked for a discussion about the intercommunication of the unconfined and confined aquifers on the Hanford Site and the possible significance on the uppermost confined aquifer if failure of natural or engineered barriers should occur. One reviewer indicated that p. 4.21 of the draft EIS contained apparently conflicting statements about the flow of water in the confined aquifer (Letter Numbers: 5-DOI, 223, 243-EPA).

Response:

The statements on p. 4.21 have been revised for more clarity. Additional discussion of the intercommunication is given in the references cited in the EIS (Strait and Moore 1982; Graham, Last and Fecht 1984).

As the reviewer noted, model streamlines shown in Figure Q.2 indicate that some groundwater in the unconfined aquifer in the vicinity of the 200 Areas moves in a northerly direction through the gap between Gable Mountain and Gable Butte under the 1983 conditions. Figure Q.3 shows that groundwater flow in this direction is dominant under the scenario for 5.0 cm/yr annual average recharge. Analysis of contaminant impact for the upper confined aquifer(s) was not made because studies indicate that although there is an interconnective window between the unconfined and confined aquifers immediately north of the 200 East Area, there is little chance for significant exchange of water (low flux) between the systems. This is indicated by head measurements in the two systems, the much lower hydraulic conductivity of the confined system, and the contemporary low concentration of contaminants in the confined system as compared to the unconfined system (Chapter 4 reference: Graham, Last and Fecht 1984; Appendix V reference: Cline, Rieger and Raymond 1985).

3.5.3.17 Comment:

A reviewer noted that the draft EIS states that peak arrival times for chemicals are about 300 and 1,200 years for the no disposal action alternative under high and low flux scenarios, respectively. If these predictions are valid, the DOE should explain how the current contamination--nitrate in excess of 20 to 45 mg/L (Price et al. 1985)--has reached the Columbia River from the 200 E Area in less than 40 years of disposal at the Hanford Site (Letter Number: 215).

Response:

The arrival times of 300 and 1,200 years for chemicals in the no disposal action alternative were based on average annual recharges of 5 cm/yr and 0.5 cm/yr, respectively. The equivalent artificial recharge caused by disposal of low-level liquid waste amounts to about 5,000 cm/yr, and is thus a substantially higher driving force resulting in a much shorter travel time. The preceding statement has been added to Section 3.4.2.3 of the final EIS.

3.5.3.18 Comment:

One reviewer noted that a direct hydraulic connection between the upper unconfined aquifer (Ringold/Hanford formations) and underlying confined aquifer materials (Ellensburg formation) in the area north of the 200 East Area is noted on p. 4.16, but that implications for contaminant transport were not included (Letter Number: 243-EPA).

Response:

Implications for such contaminant transport were discussed at p. 4.21 of the draft EIS.

3.5.3.19 Comment:

One reviewer felt that the statements on p. 4.21 asserting that observed migration of contaminants from the unconfined aquifer to the upper confined aquifer is inconsequential are unsubstantiated. Direct evidence was called for because transport of contamination from relatively local aquifer units to extensive underlying confined aquifers is a matter of concern (Letter Number: 243-EPA).

Response:

The referenced studies provide the direct evidence requested by the reviewer. DOE has funded major investigations into the question of aquifer interconnection. The detection of contamination in the confined aquifers remains of scientific and monitoring interest; however, the environmental impact of potential contamination in the unconfined aquifer is much more significant.

3.5.3.20 Comment:

Calculated concentrations in the 5-km well do not reflect additional contaminants attributable to past disposal in cribs, trenches, and injection wells (Letter Number: 243-EPA).

Response:

Where cited, the calculated concentrations are called "incremental," implying that they are above ambient. It would be expected that most if not all present contamination in groundwater will be gone by the time the predicted additions occur.

Monitoring and Compliance

3.5.3.21 Comment:

Various comments were made concerning groundwater monitoring. One reviewer, commenting on p. V.6, noted that it might be appropriate to monitor for plutonium downgradient from 216-Z-12 rather than below the crib, which was last used in 1975. A detailed map showing specific wells for monitoring of low-level waste sites was requested by another reviewer. The same reviewer took issue with a statement on page V.1 that "for more than 35 years a comprehensive groundwater monitoring program has been in effect." The reviewer felt that the program has been primarily "developmental" and asked for a history of its development (Letter Numbers: 215, 223).

Response:

The results of monitoring mentioned on p. V.6 refer to monitoring activities during operation of the crib and since closure. No plutonium was detected in the groundwater beneath the crib during or after operation. Likewise, groundwater monitoring conducted down gradient has not shown the presence of plutonium.

The DOE has not added the detailed monitoring information requested because low-level waste sites are beyond the scope of this EIS. However, information regarding monitoring wells and their locations is contained in Law and Schatz (1986).

While any monitoring program must be "developmental" to remain current with technology and expand as needed to keep pace with operations, the program has been comprehensive in scope (Price 1986).

3.5.3.22 Comment:

One reviewer asked for the most recent radionuclide, chemical and water quality information on the groundwater-monitoring wells closest to each of the active disposal sites for cooling waters, low-level and intermediate-level liquid wastes on the Hanford Site and a comparison of the data with Environmental Protection Agency standards. Another reviewer felt that a major deficiency of the draft EIS is the absence of plume-delineation maps of groundwater contamination on the scale of Figure 4.1. It is evident from references such as Price (1985) that such data are available. Inasmuch as a large portion of this contamination is from defense activities, these contaminants are therefore defense wastes and the impacts of not restoring the groundwater site should be addressed (Letter Numbers: 174, 215).

Response:

The contaminant data are available in annual reports (Price 1986) and are compared in those reports to applicable standards.

Appendix V and Volume 1 Chapter 4 were expanded to discuss current groundwater conditions. Current contamination of groundwater affects all alternatives equally and does not therefore influence alternative selection. Issues relating to groundwater contamination are being addressed and current contamination will be managed to comply with CERCLA and other applicable regulations.

3.5.3.23 Comment:

Reviewers pointed to the potential or present use of the Hanford Site aquifer as a "significant" or "special" source of groundwater or drinking water. They asked for comparison to various standards, including 40 CFR 141 and 40 CFR 191 (Letter Numbers: 215, 243-EPA).

Response:

The Hanford Site groundwater meets the definition of a "significant source of groundwater" under 40 CFR 191.12 (n)(1). It is not a "special source of groundwater" under 40 CFR 191.12 (0). The DOE will perform a compliance analysis for all applicable regulations before implementation of disposal actions.

Current levels of contamination are monitored, and the impacts are assessed and compared to applicable standards in annual reports (e.g., Price 1986). Some areas of Hanford groundwater are unsuitable for unrestricted use as drinking water because of the level of defense waste contaminants present. The DOE's assessment indicates that a user of the Fast Flux Test Facility (see Figure 1.2 in Volume 1 of this EIS) drinking water receives 0.4 mrem/yr as reported in the above annual report (not 4 mrem/yr as stated by the reviewer). No other groundwater sources of drinking water on the Hanford Site (Patrol Training Center, Yakima Guardhouse) contain any defense waste contaminants.

Modeling

3.5.3.24 Comment:

One reviewer felt that the water table contours of Figure Q.1 indicate that flow could diverge and move northward and enter the Columbia River sooner than shown in the figure. The reviewer also suggested that the possibility of repository and other withdrawals of groundwater could significantly alter the water table and severely stress the applicability of the present model (Letter Number: 215).

Response:

The water table contour is steeper to the south and east, indicating these as preferred flow directions. Under groundwater conditions assumed to return following termination of Hanford waste disposal (Newcomb, Strand and Frank 1972), the elevation of the Columbia River along the northern edge of the Hanford Site would control the elevation of the groundwater north of Gable Mountain and Gable Butte and force all streamlines originating near the 200 West Area to move southeast.

It is purely speculative to suggest the use of significant amounts of groundwater in the future. However, such use in the 200 Area might depress the water table elevations and therefore slow the transport of contaminants (Newcomb, Strand and Frank 1972).

3.5.3.25 Comment:

Several reviewers commented about various aspects of groundwater modeling. The EPA suggested strengthening "the high quality of modeling" done in the draft EIS with a tighter sensitivity analysis and groundtruthing of key parameters. Another reviewer said that the use of "representative" travel times in the unsaturated soil was unclear and inappropriate, and recommended the use of ranges for calculations. Another reviewer provided an extensive comment on Section 0.4.2, p. 0.24 relative to unconfined aquifer modeling, model calibration, validation and assumptions. This reviewer, commenting on Section Q.4, also asked for specifics of the model input parameters (Letter Numbers: 215, 217, 243-EPA).

Response:

The DOE is continuing its research activities related to geohydrologic modeling of the Hanford Site. Also, as part of the preferred alternative, DOE will continue research and development on barrier performance, recharge and other parameters that will address the EPA suggestion.

In response to the second comment, the wording on p. Q.3 has been revised to clarify that an assumption is being used. Several documents exist that demonstrate the use of the model as applied to the unconfined aquifer (Deju and Reisenauer 1976; Arnett et al. 1977; Arnett, Brown and Baca 1977; Harty 1979). The spatial variation of hydraulic conductivity has been determined from pump tests of more than 50 wells and the measurements of potentials in several hundred wells. The initial spatial distribution between measured points was calculated by applying the transmissivity iterative calculation. However, calibration improvements have been made using other techniques when new data warrant (Eddy, Prater and Rieger 1983). The model was calibrated on a set of data taken during 1973 and verified using a transient simulation extending over a 6-year period (Kipp et al. 1976; Ahlstrom et al. 1977). Current efforts to improve the modeling involve calibrating a new model incorporating the latest numerical techniques, which will permit simultaneous calculation of uncertainties.

The time-dependent equation, 0.24, can be changed to represent a steady-state system by substituting a zero for the left-hand side of the equation. The steady-state version of the model was used for the long-term simulations (10,000 years).

The aquifer was probably in equilibrium before 1945, except along the river from irrigation around the Hanford town site and in response to natural river fluctuations. Perturbation of the water table by large-volume disposal of cooling waters began in 1944-1945. It is only an assumption that the aquifer will be at steady state at some particular time in the future.

Boundary conditions on the saturated-flow model are described in Section Q.4. The basalt and river boundaries are shown in Figures Q.1 and Q.2. The river is directly coupled to the aquifer over the Hanford Reach. Relative to the specifics of model parameters, Appendix O has been revised to include a hydraulic conductivity map. Boundary descriptions are also included. The effective porosity value used for calculation of travel times was a constant of 0.1, derived from matching the low-level contaminant plumes of tritium and nitrate.

3.5.4 Surface Water

3.5.4.1 Comment:

One reviewer commented that discharge to the Yakima River may have been induced due to increased water levels in the unconfined aquifer, caused by human activities (Letter Number: 215).

Response:

In the vicinity of the Horn Rapids on the Yakima River, the relative groundwater and river elevations and geology indicate the probability of groundwater recharge taking place. Farther south, unconfined groundwater discharge to the river is possible, as the unconfined aquifer in this area is subjected to recharge associated with irrigation.

3.5.4.2 Comment:

Reviewers expressed concern about contamination of the Columbia River, both from present operations and from defense waste disposal. One reviewer urged a thorough study of the potential impacts on the Columbia River. Another requested considerations of regulatory effects. Another expressed doubt, based on past experience, about DOE's ability to contain the waste for thousands of years and contended that radioactivity in the Columbia River silt remains a potential health hazard. Other reviewers advocated finding more suitable storage away from water resources (Letter Numbers: 17, 23, 25, 26, 30, 42, 50, 66, 109, 123, 129, 147, 150, 155, 157, 158, 167, 171, 173, 187, 200, 223).

Response:

The DOE also is concerned about possible contamination of the Columbia River and the adjacent environment from radioactive waste stored on the Hanford Site. The permanent disposal alternatives were developed and assessed in this EIS expressly to address the need to discontinue storage and implement disposal to protect the environment. The assessment of impacts for all defense waste disposal alternatives reveal minimal environmental impacts. The EIS presents the potential radiological impacts on the Columbia River from these alternatives. However, additional assessment is needed for potential chemical impacts and is planned under the research identified in the preferred alternative. Present contamination levels in the Columbia River from current and past operations are continuously monitored, evaluated and reported annually. Impacts are known to be well within applicable regulations and standards.

Relative to the radioactivity in Columbia River silt, the reviewer may be referring to recent press coverage alleging a potential hazard if the silts are dredged. These silts contain low levels of radioactivity, including plutonium from fallout and from the eight now-retired once-through-cooled Hanford reactors; about 20% to 25% of the plutonium is a result of reactor operations (Beasley et al. 1981). There is no evidence that these silts present a health hazard.

See also comment 3.2.6.1.

3.5.4.3 Comment:

Several reviewers noted that contamination of the Columbia River might render the water unfit for present or future use as drinking water by downstream communities. These reviewers were concerned about both direct use through pumping of river water and indirect use through pumping of groundwater that might be recharged by the river (Letter Numbers: 16, 17, 25, 26, 44, 45, 50, 57, 59, 133, 223).

Response:

According to the impact assessments presented in this EIS, the utility of Columbia River water as a drinking water source would not be affected by the proposed defense waste disposal alternatives.

3.5.4.4 Comment:

Reviewers perceived risks to public health to be severe, and some asked for additional studies of health effects. One reviewer referred to the large volumes of waste water and airborne contamination. The reviewer went on to say that "radioactive pollution is known to cause cancer and birth defects." One reviewer commented that "too many years of careless disposal of wastes in shallow medium have and will continue to result in contamination of groundwater sources and ultimately the Columbia River. Failure to address this fundamental problem will result in an environmental catastrophe." One reviewer inquired how DOE would be able to identify sources of contamination in the future and asked for justification of the "remotest possibility" of contaminating the Columbia River (Letter Numbers: 38, 43, 123, 155, 164, 201).

Response:

The DOE is sensitive to the concerns of the reviewers for the health and safety of the population downstream from the Hanford Site. It is this concern that has motivated DOE to propose permanent disposal of the defense wastes instead of continued storage. The reviewers' statements of the risks of nuclear waste, including the perceptions of the risks of DOE's past handling of defense wastes, are without documented basis. The DOE knows of no substantiated assessments of health and safety risks to downstream populations that reflect "enormous risk." Rather, minimal risk is indicated. There is no documented evidence that Hanford operations have caused any cancers or birth defects.

The impacts of DOE's operations and waste management (including waste water disposal) have been the subject of an extensive environmental monitoring program for many years. Results of this program show the effect of Hanford activities indicated by slightly elevated levels of radioactivity in some environmental media.

Environmental standards provide for the use of natural resources, such as the Columbia River, within acceptable impact limitations. Discharge permit limits and drinking water standards are two examples of such limitations. The DOE maintains an environmental monitoring program designed to detect transport of radioactivity (and currently being upgraded to better address chemicals) away from operating or waste disposal sites. This program is revised as necessary to cover new or changed operations, conditions or applicable regulations. The State of Washington has formed no basis for changing its classification of the Hanford Reach of the Columbia River from Class A, suitable for all domestic and agricultural use.

3.5.4.5 Comment:

One reviewer stated that the EIS apparently assumes that the dilution factor will prevent radionuclides that enter the Columbia River from being a health hazard. If this is the case, it should be clearly stated. It should also be stated whether or not layers of mud could become highly radioactive. Also, several reviewers suggested that the disposal of nuclear wastes at Hanford may permanently or irreparably damage the Columbia River water resource, thereby ruining the river-based economy of the downriver areas (Letter Numbers: 25, 57, 59, 129, 133, 147, 171, 187, 200, 205).

Response:

Once nuclides reach and are mixed with the Columbia River, the concentrations would be well below the limits established by the EPA for community drinking water systems and no health hazards would result. Some nuclides would accumulate in the silts. However, there is a continuous deposition of large amounts of silt and it is unlikely that a condition would arise where the mud could be considered highly radioactive.

Also see comment 3.2.4.1.

3.5.4.6 Comment:

Several reviewers commented on the potential impacts of radionuclides and chemicals on the aquatic biota, including trout, salmon, sturgeon, shellfish, other estuarine and coastal fishes and animal populations, as well as potential impacts to consumers of aquatic and animal products. One reviewer recommended that the final EIS include a discussion of studies (by the University of Washington) of radionuclide uptake in aquatic biota (Letter Numbers: 5-DOI, 57, 187, 215, 223, 231, 234, 238/241-DOC).

Response:

The calculated concentrations of representative defense waste chemicals in Columbia River water under the several waste disposal options are well below drinking water standards (Tables 3.8 and 3.11) and would have little or no impact on Columbia River fishery resources. There is no evidence that shows that past releases of nuclides to the river at Hanford have had a significant impact on the anadromous fishes. Monitoring of the fall chinook salmon populations spawning in the Hanford Reach of the Columbia River over more than 35 years has indicated that this section of the river continues to be an acceptable spawning and rearing area for chinook. During the course of past Hanford operations, resident fish species exposed to radiation levels much greater than those projected for any of the defense waste disposal alternatives were not visibly harmed. These higher levels of radioactivity in the Columbia River also had no demonstrable effect on other ecosystem components in the river. This relates to direct doses to various species of fish and wildlife, and to accumulated radionuclides in the food chain.

Radiation doses to aquatic organisms can be calculated, but the effort would parallel that for humans. The scientific community has concluded that the evidence to date indicates that the human being is the most radiosensitive organism (BEIR Report 1972; EPA 53 FR 8181). If humans are adequately protected, so are the biota. Pathways to consumers of fish products are known, and calculation of doses to specific aquatic organisms is probably not warranted. Previous data of this type, calculated when radionuclide levels were much higher (from the original production reactors, which used once-through cooling water), revealed no short- or long-term adverse impacts to either organisms or populations of organisms. The calculations used in the process of assessing the impacts to humans include food chain bioaccumulation (concentration) factors for aquatic biota and other animals. Studies from the University of Washington's Laboratory for Radiation Ecology were valuable in defining the physical characteristics of the Columbia River plume by using the radionuclides in the sediments and organisms as tracers.

The review of studies by the University of Washington scientists of the uptake and distribution of radionuclides in marine organisms along the Washington coast would add little to the estimation of conditions that might prevail under the defense waste disposal alternatives presented in the EIS. Those studies were conducted when the concentrations of radionuclides discharged to the marine environment were many orders of magnitude greater than those envisioned in the draft EIS. The radionuclides of concern, such as zirconium-65 and phosphorus-32 that were present during the University of Washington studies would not be present in potential releases from the defense waste disposal alternatives.

3.5.4.7 Comment:

A reviewer asked for an explanation of the water quality parameters, shown in Table 4.5, that are not the same upstream and downstream of the Hanford Site. He noted, for example, that the maximum fecal coliform value at Richland is 2500 times that of the maximum value at the Vernita Bridge, and requested a statistical analysis of these data. Another reviewer asked for an analysis of the fate of various chemicals in the Columbia River, including heavy metals such as chromium, cadmium and mercury, as well as nitrates, nitrites and fluorides (Letter Numbers: 215, 223).

Response:

The maximum coliform value (in Table 4.5) for Richland under the U.S. Geological Survey sampling program was erroneous; it should read 5 rather than 5000. Table 4.5 of the final EIS has been revised. An explanation or statistical analysis of the data in Table 4.5, which are within standards, would not provide additional information useful in the comparison of the waste disposal alternatives.

The purpose of this EIS is to assess the impacts of alternative defense waste disposal actions. Impact analysis for chemicals is presented in Chapter 3. The analysis indicates that chemical concentrations in the Columbia River would be well below permissible levels under the drinking-water standards for all the disposal alternatives.

3.5.4.8 Comment:

Reviewers commented on the dilution of radioactive contaminants afforded by the Columbia River. One reviewer questioned the validity of the assumption of instantaneous mixing in the Columbia River, suggesting instead that concentrated streaming might occur. The other reviewer referred to an alleged statement at one of the information workshops to the effect "that there would be no impacts of concern even if all the waste in question flowed into the Columbia River due to the river's capacity to dilute the waste" (Letter Numbers: 5-DOI, 68, 78, 215, 219).

Response:

Thermal and dye studies of reactor effluent dilution/dispersion in the Columbia River have indicated that considerable solute (contaminant) mixing and dilution occurs in the river within a few miles downstream of the Hanford Reach, and that nearly complete mixing has been achieved at the McNary Dam site. There is no indication (or mechanism) that narrow flow paths of concentrated contaminants might be formed.

While the Columbia River is able to dilute waste to innocuous levels, the statement referred to in the comment is somewhat oversimplified. The intent of this scenario was to demonstrate the exceptional "safety net" provided by the Columbia River. At a time when a substantial portion of the strontium-90 inventory has decayed away, mixing of the remaining inventory into the river over one year's time would not likely result in any effect from consuming drinking water derived from the river. A discussion of this scenario does not indicate DOE advocacy of such a practice; it only helps one visualize the capacity of the Columbia River to reduce potential risks. On a statistical basis, when dose is accumulated over population and time, some health effects might be expected. Consideration of the scenarios described in this EIS is believed to be a more reliable indicator of the risk to be compared among the alternatives (including the cases where none to few effects are indicated, Section 5.5.4.1).

3.5.4.9 Comment:

A reviewer suggested that the potential for Columbia River meander, meander migration and avulsion, and their ramifications should be addressed in the EIS (Letter Number: 215).

Response:

A geomorphic study is presently being conducted by Pacific Northwest Laboratory to answer such questions.

3.5.4.10 Comment:

Reviewers pointed out that Figure 4.7 is outdated and does not show all past and present waste ponds on the Hanford Site and asked for the information to "ensure complete disclosure of contaminated areas." A reviewer also suggested that the final EIS should address characterization of the ponds and measures to "deal" with them. Another reviewer requested specific and detailed information about waste water and groundwater along the Columbia River (Letter Numbers: 174, 215).

Response:

The purpose of Figure 4.7 was to show ponds and ditches that were in use at the present time. It is not within the scope of this EIS to disclose the locations and levels of all contaminated areas or to "deal" with them. The scope of the EIS has been clearly identified as including disposal of high-level, transuranic (greater than 100 nCi/g), and tank wastes. Additional information concerning the impacts of the low-level waste disposal sites from a cumulative impact standpoint is given in the revised Section 5.1.4. Similarly, the specific information requested for the existing Columbia River shoreline springs is outside the scope of the EIS.

3.5.4.11 Comment:

A reviewer wanted to know what the health effects would be if all of the waste present after 300 years (or 1,000 or 10,000 years) suddenly were deposited in the Columbia River and suggested that a few simple, upper-limit, bounding worst-case scenarios could be done (Letter Number: 171).

Response:

Because the scenario that deposits all of the waste suddenly in the Columbia River has essentially zero probability, it was not analyzed. See also comment 3.5.4.8.

It is felt that the impact analyses reported in the draft EIS Chapter 5 represent bounding analyses. Although these impacts are not called "worst case," the DOE judges that they fulfill the intent for a worst case analysis.

3.5.5 Pathway Analyses, Dosimetry and Health Effects

3.5.5.1 Comment:

A concern was raised that the draft EIS neglected the effects of bioconcentration mechanisms on the food chain, and thus neglected the viability of local plant and animal communities and the long-term effects on flora and fauna (Letter Numbers: 38, 164, 178, 187, 215, 216).

Response:

The food chain is recognized as a pathway for contaminant accumulation at various trophic levels. The food-chain impacts are included in all reported doses to humans. The scientific community has generally agreed that the most radiosensitive organism is the human, and that radiation limits established for humans are also protective of terrestrial and aquatic organisms. For the purposes of choosing among alternatives, dose calculations for plants and animals would not improve the basis for conclusions derived from doses calculated for humans.

3.5.5.2 Comment:

Regarding p. F.12, Equation F.2, a reviewer inquired whether the last two terms within the brackets of the equation are used only for plants growing directly above with roots growing into buried waste (Letter Number: 243-EPA).

Response:

Yes.

3.5.5.3 Comment:

One reviewer raised the concern that children are more susceptible to harm from exposure to radiation than adults; therefore, that issue should have been addressed in the draft EIS (Letter Number: 216).

Response:

Doses to age groups and other critical subgroups are discussed in Section F.1.5.1. For the purpose of comparing between alternatives, only doses to adults were calculated to show different degrees of impact.

3.5.5.4 Comment:

A reviewer had the following comments. In Volume 2, on page xli, Figure 3 (Potential Exposure Pathways), there is no pathway illustrated from the buried waste to burrowing animals to humans. Burrowing animals may transport the buried waste to the surface. This process may affect humans (directly through inhalation, or indirectly through uptake by crops that may be grown on the contaminated soil). If shallow root vegetation is included in the pathway, then animal intrusion must be added as well (Letter Number: 223).

Response:

Figure 3 is a generic figure. Transport by animals from "Buried Waste" to "Surface Soil" can be inferred. All other pathways are then the same.

3.5.5.5 Comment:

Reviewers requested that additional information regarding DOE's impending adoption of the dosimetry systems of ICRP Publications 26 and 30 be included in the EIS (Letter Numbers: 147, 171, 217).

Response:

The discussion of this possibility is included in Chapter 4, Chapter 6, the "Key Parameters" section of the Introduction to the Appendices, and in Appendix F. The newer dosimetry system would have minimal influence on the choice between the analyzed alternatives.

3.5.5.6 Comment:

A reviewer requested additional detail on the data used to generate the atmospheric dispersion calculations reported in Appendix F (Letter Number: 217).

Response:

References to the documentation of the basic data were inadvertently omitted from the draft EIS Appendix F. References have been added for the data on wind velocity, stability, and frequency of occurrence, as well as the actual calculational methodology.

3.5.5.7 Comment:

Reviewers noted that some accident risks were overstated because of the assumption that 100% of the strontium fluoride was in the form of respirable particles. The reviewer requested a new analysis using more reasonable estimates as follows: 1% of the strontium fluoride is in the form of dispersible particles and 5% of the dispersible fraction is also respirable (Letter Numbers: 147, 217).

Response:

The accident analysis in Appendix I has been recalculated using the new parameters.

3.5.5.8 Comment:

Reviewers made several comments relative to Appendix R: 1) In the tables presenting the performance of each alternative, definition of terms (i.e., "Transport Assessment Table") should be added to the text. 2) A table presenting various health standards should be added. 3) What is a Transport Assessment Table? 4) Why did Appendix R not address the performance of the various alternatives in terms of the chemical species which may be released from the storage sites (Letter Numbers: 231, 234).

Response:

1) Text has been revised on page R.5 to cross reference Appendix Q. 2) The requested information is already provided as Chapter 6 of Volume 1. 3) A "Transport Assessment Table," as described in Section R.1.4.1, is a summary table of hydrologic transport results presented in Appendix Q. 4) The chemical speciation of radionuclides is addressed in Appendix P.4, especially as it relates to the choice of K_d selected for the transport assessments. Impacts of chemicals were limited to estimates of concentrations of selected chemicals in groundwater and the Columbia River and comparison with EPA drinking water standards (40 CFR 141). Additional assessment of chemical impacts is planned to be conducted under the preferred alternative for single-shell tank wastes and wastes to be disposed of in grout.

3.5.5.9 Comment:

One reviewer requested a better definition of health impacts. Two reviewers noted that the draft EIS looked only at fatal cancers and genetic defects caused by low exposures to radiation. One of the reviewers felt that this would seem to artificially reduce the total impact, which would include nonfatal cancers and other health effects. Other reviewers concluded that because these effects had been omitted from the analyses for each alternative, the relative ranking of the alternatives, if included, would not change. Finally, reviewers questioned the relationship between the calculated doses and the "Hazard Index" used in Table 3 (Letter Numbers: 71, 217, 223, 243-EPA).

Response:

For each of the alternatives and scenarios, radiation dose is calculated. From that calculation, estimates of fatal cancer and genetic effects are calculated using either the values given in Appendix N for populations, or those modified for individual prolonged exposures. Fatalities calculated in this way bear no relation to the "Hazard Index" concept, which was based simply on total inventory of radionuclides multiplied by EPA estimates of the number of fatal cancers per unit quantity of radionuclide reaching a river. (No consideration was given to whether or not radionuclides of Hanford origin would reach the river.) Inasmuch as nonfatal cancer and other effects are much less well correlated with radiation dose, these were not used to avoid further complicating the comparisons of the alternatives.

3.5.5.10 Comment:

One reviewer noted that natural background radiation used frequently in the EIS as a safe standard is an unreasonable standard, and added that natural background radiation has risen significantly in correlation with bomb testing (Hearing Number: 633).

Response:

It was not intended that natural background radiation be taken as a "safe standard." If a dose from disposal is very small compared to background, a judgment as to its level of importance can be made. Natural background radiation does not include that from bomb tests.

3.5.5.11 Comment:

Reviewers noted that in the calculation of health effects of radioactive sources, one cannot make a direct correlation between naturally occurring uranium ore and defense waste, or cosmic rays and defense waste (Letter Numbers: 14, 193, 216, 242).

Response:

The primary basis for describing radiological impacts in the EIS was radiation dose. Radiation dose (or more properly, radiation dose equivalent) to the human body is the common basis by which impacts of any radiation source may be compared with any other radiation source, whether it be defense waste, natural background, uranium ore, commercial reactor waste or dental x-rays. Quantity, concentration, type of radiation, radioactive half-life, biological half-life, metabolism, and mode and duration of exposure are all taken into account when impacts are being evaluated.

3.5.5.12 Comment:

Reviewers contended that cancer incidence rather than cancer fatalities should be the measure of radiological risk. Reviewers were concerned that while comparing dose equivalent with natural background is acceptable in terms of setting the perspective, it should not be used as a comparison to judge a "risk's acceptability" (Letter Numbers: 71, 217, 223).

Response:

Fatal cancer incidence is used by both the EPA and NRC as a measure of radiological impact. In this EIS the incidence of genetic effects was also incorporated into the measure of radiological impact as "health effects." The additional uncertainty encountered by including cancer incidence does not add information that is helpful in discriminating among the alternatives.

The dose from natural background is a reasonable perspective for doses received from other causes. No position need be taken as to whether natural background is or is not harmful. If a dose from an activity is very small (say, a fraction of a percent) compared to the inescapable dose from natural background, there is little basis to conclude that the activity is radiologically unacceptable. The DOE intends to continue to provide natural background as a perspective. In addition, reference has been made to applicable EPA standards, such as 25 mrem/yr from airborne pathways or significant groundwater sources or 4 mrem/yr from community drinking water systems.

3.5.5.13 Comment:

A reviewer stated that the summary of the types of genetic disorders on page N.8 is misleading and has very different implications (especially for the general reader) than the descriptions in the source references; also, that N.4 deserves more discussion, especially the relationship of the totals to the other values in the table. Another reviewer observed that the significance of the health effects should be further explained since the risk of radiation is not evident to the senses or within the experience of the average individual (Letter Numbers: 14, 223, 243-EPA).

Response:

The purpose of the genetic disorder discussion is to give the general reader some understanding of the subject as a basis for what constitutes the health effects values presented in this EIS. In this context, the discussion is sufficient and accurately represents genetic disorders. References are provided for the reader who wishes to obtain more detailed information.

The data of Appendix N (Table N.4) have been used to convert potential defense waste disposal radiation doses to health effects, which are compared to the health effects from background radiation. These conversions and comparisons are intended to provide the feeling for "significance" suggested by the reviewer.

3.5.5.14 Comment:

A reviewer requested the inclusion of confidence intervals in the presentation of estimated doses. Another suggested that although the release-to-dose and dose-to-risk conversions might have large uncertainties, the alternatives could still be compared because the uncertainties of each would tend to cancel out (Letter Numbers: 120, 143, 243-EPA).

Response:

The capability in terms of validated modeling and data bases does not yet exist to calculate fully in statistical terms the bounds of the uncertainties of the calculated doses.

However, Appendix S does include an examination of uncertainties and confidence limits for releases to the groundwater over 10,000 years. These calculated releases are then applied to the EPA release limits, which are based on the acceptable number of health effects over the 10,000-year period.

3.5.5.15 Comment:

A reviewer requested that the EIS demonstrate that the conversion of liquid wastes containing carbon-14 and iodine-129 into grout will result in long-term retention of these materials (Letter Number: 215).

Response:

The purpose of this EIS is to outline the potential impacts of the alternatives using existing knowledge. An ongoing grout development program exists to study the efficacy of the grout as a disposal medium. Before any grout is produced, a separate performance assessment based on this research will be prepared and issued.

3.5.5.16 Comment:

A reviewer suggested that it was not clear how possible health effects resulting from chemicals associated with the wastes were assessed in the EIS (Letter Number: 215).

Response:

Results of an analysis of the migration of chemicals from the wastes are presented in Appendix U of the EIS. The results of this analysis are used in Chapter 5 to compare to applicable regulatory limits. The regulatory limits themselves, however, are based on health effects. Since, for the disposal alternatives, the concentrations of chemicals in the groundwater generally meet the EPA requirements, no major health effects are expected.

3.5.5.17 Comment:

One reviewer commented that the results of the no-barrier scenario include predicted well concentrations that exceed water quality standards (40 CFR 141.11) for chromium, mercury and nitrate. These standards are not exceeded for the 100%-effective protective barrier case. Because this latter case is, by definition, not conservative, analyses of partial failure of the barrier are necessary to determine the point at which compliance with federal regulations is attained. At that point, the degree of conservatism can be taken into account in the decision of selecting an alternative (Letter Number: 215).

Response:

As may have been noted, the results for each of the disposal alternatives were the same in terms of concentrations of chemicals in groundwater. The reason was that the chemical wastes were treated essentially the same in each disposal alternative, namely, buried near surface and covered by the protective barrier. Thus, that presentation merely contrasted the effects of disposal with barriers with those of near-surface burial without barriers, and was not meant to provide a basis for determining a choice among disposal alternatives. The issue of chemicals and chemical hazards is presently under study in the current evaluation of compliance with the Comprehensive Environmental Response, Compensation and Liability Act

(CERCLA). According to the preferred alternative, that part of the defense waste disposal decision will be deferred pending development of additional information.

3.5.5.18 Comment:

Reviewers suggested that the metabolism for "maximum man" be used to calculate doses to exposed individuals, in addition to "standard man." Another reviewer questioned whether reported doses to users of well water were calculated for maximum or average parameters (Letter Numbers: 223, 243-EPA).

Response:

The definition of the "maximally exposed individual" is used throughout the draft EIS as a measure of the largest anticipated impact on a reference individual. "Standard man" (or "reference man") refers only to the dosimetry model's internal parameters. That is, realistic values of parameters were chosen to result in estimates of dose that would not likely be exceeded in actual practice. Thus the values were conservative but not extreme. The captions for Tables 3.19 and 3.20 of the final EIS have been revised to include the word "maximum."

3.5.5.19 Comment:

Reviewers noted that the method for determining radiation dose and health risk due to naturally occurring sources, and any inherent assumptions, were not discussed and should be included, that such calculations were intimately tied to projected population figures (Letter Numbers: 215, 217).

Response:

Collective background doses, as presented in this EIS, are calculated as the product of the total population (in persons) times the average background dose rate (approximately 0.1 rem/yr) times the number of years in question. Since there is no evidence that the population will decrease over time, and since the increases are speculative at best and the use of the chosen 1990 population figure is only to provide a basis for the dose perspective, it is deemed adequate to assume a constant population over the operating period of waste disposal. The calculations are linear with respect to population size, and therefore the impacts relative to background do not change. It should be noted, however, that population increases were taken into account for long-term calculations, as described in Appendix R. The 1990 population of 420,000 is a simple linear extrapolation of recent growth rates.

3.5.5.20 Comment:

Reviewers requested that the phrase "realistic but conservative" be explained and suggested that "worst-case" scenarios be used (Letter Numbers: 171, 215, 243-EPA).

Response:

As stated in the Introduction to the Appendices, pp. xii-xiii, "The scenarios chosen for analysis are representative of many types of potential exposure and the parameters chosen for each are selected to ensure that the calculated results contributed toward representing the bounding analysis of consequences." That is, the parameters chosen could result in estimates of dose that would not likely be exceeded. The DOE believes that bounding analyses performed in the EIS meet CEQ requirements for analysis of all reasonably foreseeable significant adverse impacts.

3.5.5.21 Comment:

Page N.1, Introduction, lines 26-29: It should be noted that our inability to demonstrate effects in low-level animal exposures is not related to the absence of an effect. The problem with the animal studies is our inability to have a large enough group of animals exposed. If the number of animals in a study is small compared with the expected risk of effects, it is unlikely that effects will be observed (Letter Number: 243-EPA).

Response:

The final EIS has been revised to recognize the problem of limited numbers of animals.

3.5.5.22 Comment:

Page N.1, Introduction, lines 31-37: The NCRP statement on interpreting extrapolated risk as "actual risks" should be set in perspective by citing ICRP 26: "These risk factors are intended to be realistic estimates of the effects of irradiation at low annual dose equivalents (up to the Commission's recommended dose-equivalent limits)." (Ann. ICRP 2/1, 1978). Or, DOE could cite UNSCEAR on the 1977 risk estimates, "...namely, that the risk of fatal cancer induction for X- and gamma rays is on the order of 2 x 10^5 for an effective dose equivalent corresponding to one year of natural background, as an average for both sexes and all ages." (UNSCEAR 1982, p. 11, par. 53). Both the ICRP and UNSCEAR passages suggest some level of confidence in the realism of the estimated hazards (Letter Number: 243-EPA).

Response:

Although the comment has merit, its incorporation into the EIS analysis would amount to inconsequential qualification and counter-qualification, which would only lengthen the document without changing any numbers or conclusions.

3.5.5.23 Comment:

Page N.2, Introduction, first paragraph: The use of comparing dose equivalents with natural background is acceptable in terms of setting the perspective. However, we do not believe that one should use such a comparison to judge a "risk's acceptability." DOE needs to clarify its intentions with regard to the comparisons with natural background radiation exposures (Letter Number: 243-EPA).

Response:

Natural background radiation is considered a useful reference to help the reader to understand the magnitude of both the doses and risks involved in waste disposal alternatives. Also see comment 3.5.5.12.

3.5.5.24 Comment:

Page N.3, Section N.1, first full paragraph: the support for the linear-quadratic dose response is based on non-human data. It should be pointed out that for those cancers in many for which there are adequate data to determine the dose response (breast, thyroid, and more recently, stomach) the dose response relationship is linear (Letter Number: 243-EPA).

Response:

The text of the cited paragraph has been revised in response to this comment.

3.5.5.25 Comment:

Page N.7, Section N.1, lines 1-4: The changes in dosimetry in Japan affect not only the quadratic model argument but that for linear-quadratic, too. The linear-quadratic model for solid tumors for the A-bomb survivors was constrained, i.e., forced to fit both gamma-ray and neutron parameters from the linear-quadratic model for leukemia. The leukemia model, in turn, is quite strongly affected by the neutron dose. Since the neutron dose in Japanese A-bomb survivors is radically changed in the new dosimetry, especially at high exposures, the linear-quadratic model may no longer be a viable alternative for human dose-response models. This should be addressed (Letter Number: 243-EPA).

Response:

The text of Appendix N has been revised to address this comment.

3.5.5.26 Comment:

Page N.7, Section N.2, general: At some point the section on genetics should discuss the recent reports on genetic studies on Japanese A-bomb survivors, viz., C. Satoh et al., "Genetic Effects of Atomic Bombs," pp. 267-276 in Human Genetics, Part A, "The Unfolding Genome," A. R. Liss, Inc., 1982; W. J. Schull, et al., "Genetic Effects of the Atomic Bombs: A Reappraisal," Science 213, pp. 1220-1227, 1981; W. J. Schull, and J. K. Bailey, "Critical Assessment of Genetic Effects of Ionizing Radiation on Pre- and Postnatal Development," pp. 325-398 in Issues and Review in Teratology, Volume 2, H. Kalter, editor, Plenum Press, NY, 1984). These reviews suggest that the genetic risk in man is at least four times lower than is calculated in BEIR III or UNSCEAR 1982 (Letter Number: 243-EPA).

Response:

While it is recognized that other literature, including EPA's background document in support of 40 CFR 191, contains suggestions of a lower genetic risk to man, it is believed preferable for present purposes to continue use of the conservative BEIR III analysis.

3.5.5.27 Comment:

A reviewer commented that the draft EIS does not differentiate between projected differences in impacts due to varying degrees of conservatism and those due to estimated or expected performance of the disposal technologies (Letter Number: 215).

Response:

Degrees of conservatism were consistent for each alternative. However, some parameters (e.g., distribution coefficient, K_d) might be more conservative than others. Where precise data were known, they were used; where data were inconclusive, conservative values were used. Thus, the levels of conservatism are essentially consistent among alternatives within the level of present knowledge and technology development. The differences among alternatives should be considered real differences for purposes of comparison.

3.5.5.28 Comment:

Reviewers questioned whether daughter products were being properly accounted for in the calculations and adaptation from references (Letter Numbers: 101, 120, 143, 223).

Response:

Tables of inventories cited in Appendix B do not expressly include short-lived daughters of important radionuclide parents. In addition, the date for which the inventory is represented differs by several years in a report by Rockwell (1985) and this EIS. Decay to the referenced date was accounted for correctly between the two documents. In the calculation of dose, the contribution from radiation during decay of the short-lived daughters was always included.

3.5.5.29 Comment:

A reviewer noted that the half-lives of some of the radionuclides addressed in the draft EIS are very long, and that the potential health hazard will exist far into the future. This reviewer suggested that the EIS must address the entire time that the material will remain hazardous (Letter Number: 216).

Response

The 10,000-year period required by EPA for analysis indicates that the stabilized wastes would have a limited potential for producing doses projected into the indefinite future. The analysis did not indicate any major potential for doses of greater magnitude than those shown for the first 10,000 years.

3.5.5.30 Comment:

A reviewer commented that doses calculated do not identify major assumptions in the transport equations, i.e., groundwater velocities, retardation values, or values of effective porosity used (Letter Number: 215).

Response:

Doses presented in Sections 3.4.2.3 and 5.2.4.1 were derived from material presented in Appendix R. Doses calculated in Appendix R were based on the parameters given in Appendices O, P and Q. The major assumptions referred to have been explicitly cited in Appendix O or Q as appropriate.

3.5.5.31 Comment:

A reviewer commented on page 5.34 of the draft EIS, noting that diffusion and transport of waste through soils will result in a dose of about 10 man-rem over 10,000 years for the population downstream from the Hanford Site. This dose was projected to peak in the year 12,000 as a result of technetium-99 and carbon-14 effects. The draft EIS claims that this peak dosage would not be expected to produce any health effects; however, it should be taken into account in calculation of radiation doses to the general public (Letter Number: 215).

Response:

The material referenced has been clarified as follows: "This dose resulted principally from technetium-99 in single- and double-shell tank waste." Reference to "peak" was irrelevant since the dose was integrated over 10,000 years. All doses are taken into account in arriving at radiological impacts. For perspective, a population dose of 10 man-rem would be received by the present population used for dose estimates (340,000 within 80 km of the Site) in just 3 hours from natural background.

3.5.5.32 Comment:

Reviewers noted that the draft EIS does not address the possibility of health effects accumulating over generations, as would occur with genetic damage, nor does it consider the effect that the area's other radiation sources will have as a group on the local population and environment over tens of thousands of years. One of the reviewers commented that natural background is an inappropriate comparison because it is delivered at a lower dose rate than that expected from defense waste and risk factors for defense waste may change (Letter Numbers: 178, 193, 216, 223).

Response:

Doses to the relevant population groups were presented in the draft EIS and were estimated as accumulations over 10,000 years. On the basis of these population doses, health effects ranges were calculated using the upper range of anticipated health effects per million man-rem of population dose (see Appendix N). These health effects included fatal cancers and genetic effects to future generations.

Other radiation sources in the area are included in an expanded discussion in Section 5.1.4. "Late genetic effects" are not dismissed in Appendix N; they are, in fact, specifically included. All genetic risk estimates quoted in Appendix N and employed in the EIS are for "all generations." "Early spontaneous abortions," as noted on page N.7, are not considered. They are impossible to estimate and would in any case seldom be detected. They have not been considered in an evaluation of radiation risks as a mortal or serious effect.

Use of natural background dose for perspective is usually limited to cases where either the individual dose or the collective dose is small and/or less than that from background radiation. At doses near background there is no evidence that dose rate plays any role in modifying biological effect.

3.5.5.33 Comment:

A reviewer made the point that long-term risk to public health and safety and the environment simply cannot be accepted. No action should ever breach that standard (Letter Number: 53).

Response:

Risk is an everyday part of life; however, it can be controlled to the point of insignificance in many instances. That is what the DOE is endeavoring to do in proposing disposal of Hanford defense wastes. Disposing of Hanford wastes as soon as possible will reduce risks associated with storage that might otherwise increase as the storage facilities age.

3.5.5.34 Comment:

A reviewer recommended that the EIS present an analysis, for each of the alternatives, of radionuclide concentrations in groundwater for the purpose of addressing the requirements in 40 CFR 191.16 (Letter Number: 243-EPA).

Response:

The DOE understands that 40 CFR 191.16 would not apply at Hanford, because the aquifer is not a "special source" of drinking water as defined in 40 CFR 191.

See also comment 2.4.1.20.

3.5.5.35 Comment:

A reviewer noted that the calculated health effects in Section 5.3.4.4 of the draft EIS should be 0 to 2 for 2000 man-rem and 0 to 4 for 3,600 man-rem (Letter Number: 243-EPA).

Response:

The EIS has been revised. See also Appendix R, Table R.67.

3.5.5.36 Comment:

A reviewer stated that "Although as stated, in most epidemiological studies human exposures are to relatively large total doses or high dose rates, this is no longer true for radon daughter exposures. Some recent occupational studies and some animal studies report excess lung cancer at cumulative occupational exposures at or below average lifetime environmental exposures" (Letter Number: 243-EPA).

Response:

The statements in Appendix N were that the reports that were noted drew their conclusions from human effects derived from a number of activities and that the observations were made at relatively high total doses of radiation and at relatively high dose rates. The statement was not made that "...in most epidemiological studies human exposures are to relatively large total doses or high dose rates."

3.5.5.37 Comment:

Reviewers disagreed with the selection of the BEIR III linear-quadratic dose/response risk factors for projecting potential health effects. One reviewer requested that a supralinear model be used (Letter Numbers: 193, 216, 217).

Response:

The linear-quadratic form of the BEIR III results was used to select the risk factor, but is applied using the linear theory. Use of a purely linear theory would only raise the BEIR III estimates by about a factor of two, keeping them well within the envelope of 100-1000 effects per million man-rem, as discussed in Appendix N.

3.5.5.38 Comment:

Several reviewers commented on the comparison of the risks calculated using information specific to the Hanford Site and the generic factors used by the Environmental Protection Agency (EPA) in deriving the release limits for 40 CFR 191. One suggested that the diets used were not representative of the Indians' fish consumption. Another commented that the models used by the EPA were similar, but not identical to, those in the AIRDOS-EPA computer code, and that the input parameters were chosen to try to yield generally realistic results. Regarding the Hanford-specific DITTY calculations, a reviewer asked how DOE estimated fatal cancers and what risk conversion factors were used (Letter Numbers: 215, 243-EPA).

Response:

For comparison, organ doses for the Hanford Site were calculated using the DITTY computer program, and then the EPA risk conversion factors were applied and summed. The method is identical to the EPA method of calculating total health effects from a given population dose. The Hanford parameters used represented population averages between Hanford and the Pacific Ocean. The intent of the calculation was to estimate the total number of health effects, not their distribution in specific segments of the population. Some minor changes in the EPA methodology between the original drafts and the final publication, which showed up as apparent inconsistencies in the comparison, are now addressed in Appendix F.

3.5.5.39 Comment:

Reviewers asked for additional explanation of the hazard index used throughout the draft EIS, and particularly in Table 2 (Letter Numbers: 223, 243-EPA).

Response:

The Hazard Index is derived from factors developed by the Environmental Protection Agency (EPA) in preparation of its regulations on standards for disposal of high-level and transuranic waste, 40 CFR 191. The value presented is the inventory of a nuclide at a given time multiplied by the EPA factor for that nuclide, which is the number of fatal cancers predicted to eventuate if one curie of the nuclide were to be released directly to surface waters.

A definition of "Health Hazard Index" has been added to Table 2 (now Table 1.2) in the final EIS. Basically, the numbers show that radionuclides usually thought of as high-level, such as strontium and cesium, decay in a relatively short time, as compared to plutonium in transuranic waste, which retains its hazard level for a considerable time. The hazard level for uranium goes on almost indefinitely without change.

3.5.5.40 Comment:

A reviewer commented that the draft EIS says that the dose associated with the no disposal alternative, though larger than for the other alternatives, would not be expected to be fatal, and asked whether that also means that the Health Index would be zero as well. How does fatality interrelate with health indices previously discussed? (Letter Number: 223).

Response:

Fatalities discussed in conjunction with Table 3.18 bear no relation to the Hanford Index mentioned earlier. Doses here are lifetime individual doses for which it was assumed for comparative purposes, that 30 rem/yr lifetime would result in fatality. This is a gray zone of radiation response; i.e., too high a dose and too few people to use the usual dose conversion to health-effects relationship and too low a dose to be clearly fatal.

3.5.5.41 Comment:

A reviewer noticed that on p. 4.4, first paragraph, where the EIS states that the whole-body dose to the maximally exposed individual for 1984 was two millirem, it probably should also be added that this two millirem was not measured in the environment but rather was derived through the use of models (Letter Number: 223).

Response:

The EIS has been revised in response to the comment.

3.5.5.42 Comment:

Reviewers suggested that regional epidemiological studies be initiated to try to determine the effects of low-level radiation on the local populations (Letter Numbers: 147, 164, 199, 217, 231, 234. Hearing Numbers: 557, 613, 657).

Response:

On September 26, 1986, the Hanford Health Effects Panel (sponsored by the States of Washington and Oregon, the Yakima Indian Nation, Confederated Tribes of the Umatilla Indian Reservation, and Nez Perce Indian Tribe, and the Indian Health Service) issued a set of recommendations for additional studies of the possible effects of all past Hanford-related radiological exposures. The DOE, working with the Hanford Historical Document Review Committee (composed of representatives from all of the above groups) has initiated a historical dose reconstruction project to allow estimation of past environmental doses. Negotiations are under way to begin preliminary epidemiological studies based on the results of the dose reconstruction. None of these activities is directly related to the completion of the EIS, however.

3.5.5.43 Comment:

One reviewer noted that many of the values in Tables 3.14 through 3.17 exceed the permissible values specified in 40 CFR 191.15 even though only the drinking water pathway is considered; however, there is no time given when these doses occur in Tables 3.15 and 3.16. For purposes of 40 CFR 191 all potential pathways need to be identified and analyzed and the maximum annual doses occurring in the first 1,000 years need to be identified. This is true for both whole-body and organ doses. It was also noted that Tables 3.18 and 3.19 should indicate that the reported doses are maximums or some other measure (Letter Number: 243-EPA).

Response:

Values in Tables 3.14 and 3.15 do not exceed the permissible limits for 40 CFR 191.15 for the disposal alternatives. The doses occurred about 5,000 years after disposal.

The doses for the in-place stabilization and disposal and reference alternatives exceed the 25 mrem/yr limit of 191.15 in Table 3.16 (at 30 mrem/yr), but are the result of disturbed performance of the disposal system. That result was derived from a hypothetical scenario that included a wetter climate and both disruptive and functional failures of the barrier beginning in the year 2500. The projected doses occurred 200 years after that; hence, the time after disposal would be 650 years. Maximum doses to individual organs and their time of occurrence are given for several scenarios and for the various alternatives in Table 3.17. For undisturbed performance of the barrier system, there are no potential pathways for exposure during the first 1,000 years after disposal.

Tables 3.19 and 3.20 (3.18 and 3.19 in the draft EIS) have been revised to show that they provide an estimate of the maximum dose.

3.5.5.44 Comment:

One reviewer expressed that the final paragraph on page xi, under "Features of This Approach," is misleading in stating that the "uncertainty" is less than a factor of 2 or less. Uncertainty is usually applied as a plus or minus factor. In Table 4, if the ratio is reversed, i.e., ICRP-30 over ICRP-2, the uncertainty is 5 to 25. The reviewer felt that the text should be changed to reflect this situation (Letter Number: 243-EPA).

Response:

The statement in question was "It can be seen that possible uncertainties in the dosimetry affect the reported critical organ doses by factors of two or less, and the total-body (or whole-body) doses by less than an order of magnitude." It is "doses" rather than "uncertainty" that is being measured. To clarify this the words "possible uncertainties" have been replaced by "differences." The ratios in Table 4 could be reported either way to the same effect (however, the "uncertainty" is not 5 to 25; e.g., ICRP-2 Dose = 0.04 x ICRP-30 Dose has the same meaning as ICRP-30 Dose = 25 x ICRP-2 Dose).

3.5.5.45 Comment:

One reviewer noted that the meaning of the footnote in Table 3.26 needs clarification (Letter Number: 243-EPA).

Response:

The footnote in question read: "Based on 1 chance in 1,000 of exceeding values listed." The development of radiological impact as probability-weighted fatalities proceeded as follows. Using the probability of drilling/excavating into a waste site from the area of the waste site of interest and the average borehole drilling frequency given in Appendix S, an average number of intrusions per year was developed. The Poisson distribution was then used to obtain the number of intrusions for which the chances were less than 1 in 1,000 of the number being larger. It was then assumed that all intrusions were clustered during the period of lethality (about 200 years for this scenario). Table 3.27 (previously 3.26) has been revised in the final EIS and values are presented at the 1 chance in 10,000 level in accord with usage in Appendix S.

3.5.5.46 Comment:

A reviewer inquired, in regard to page 5.37 of the draft EIS, whether 7000 years is when the maximum dose occurs (Letter Number: 243-EPA).

Response:

The year AD 7000 is when drilling into groundwater is postulated to occur. That is the time at which the highest dose-contributing concentrations would occur. The maximum potential 70-year total-body dose of 0.1 rem is the maximum cumulative dose that one would receive under the stated conditions.

3.5.5.47 Comment:

The term "radiation work" is ambiguous--does it refer to work in direct contact with radioactive materials or to all disposal activities? (Letter Number: 215).

Response:

The term radiation worker applies only to those individuals working with or near radiation sources such that their occupational exposure is monitored on a frequent basis (in contradistinction to individuals working at the Site whose exposure is monitored with annually read dosimeters).

3.5.6 Disruptive Scenarios

Climate Change

3.5.6.1 Comment:

The following comments were received regarding the impacts of climate change: 1) The EIS discusses possible impacts from climate change, but the treatment of this issue was considered by a reviewer to be inadequate from the standpoint of human safety. 2) Reviewers contended that the safety of the buried defense wastes and the repository must be considered on a geologic timescale. 3) A reviewer requested further clarification of the EIS projection that precipitation might double in eastern Washington, and that there would be only a small increase in water entering the surface aquifer (Letter Numbers: 44, 74, 156, 171, 177, 215, 216, 217, 223).

Response:

In this EIS, the principal time of interest is taken to be 10,000 years in compliance with the provisions of EPA's standards for protection of the environment from disposal of high-level and transuranic waste, 40 CFR 191, (which also provides for allowable releases of radionuclides during the 10,000-year time period). In some instances, results are presented in the EIS for estimates of impacts that exceed the 10,000-year time; e.g., Figures 3.7 and 3.8 show radionuclide concentrations and doses calculated to more than 100,000 years. While time periods longer than 10,000 years may be of interest in terms of potential impact, the increasing uncertainties in the analysis make the results of questionable value when the disposal options are compared.

Although it is not referenced in the draft EIS, the DOE contracted with the Anthropology Department of Washington State University to provide information on the utility of fossil pollen records in suggesting timing for climate changes and possible severity. They determined that because published reports were limited to forested areas on either side of the Cascade Mountains (none within 100 km of the Hanford Site; also see Leopold and Crandell 1958), it would be necessary to initiate data collection in eastern Washington. Difficulties involving coring, funding and time constraints precluded completion of the study.

The DOE also contracted with the Laboratory of Tree-Ring Research at the University of Arizona to determine whether dendroclimatic reconstructions (correlation of tree rings with climate) could be used to predict future climate in the Hanford area based on the more distant past. The only significant stand of trees in the Hanford area is the Juniper Forest north of Pasco, Washington; however, it was not possible to sample these trees within the funding and time constraints of the project. Thus the tree-ring study was limited to analysis of previous studies of tree-ring chronologies from western North America rather than on local field work. The conclusion of the tree-ring work was that the average annual precipitation during the years 1602 to 1900 was 0.32 inches greater than it has been in the 20th century. Although the tree-ring studies did not establish a basis for establishing future climate, further field studies might help establish such a basis.

In recognition of the existence of past glacial floods, called Bretz, Missoula or Spokane floods, DOE contracted with R. G. Craig of Kent State University to study the recurrence potential of glaciation and to develop a prediction of the fate of near-surface materials on the Hanford Site if glacial activity were to occur. Using change-in-climate theory that was based on perturbations of the earth's orbit over very long time spans, Craig estimated that, if glacial activity were to occur, the ice sheets would start reforming in about 15,000 years and that by about 45,000 years catastrophic floods of the Missoula type would recur. Although no credit was taken in the EIS, it would seem likely that humans would be able to prevent water from storing to critical depths and thus prevent the catastrophic floods, even if they were unable to alter the progress of glaciation. References regarding the glaciation studies are cited in Section 3.4.2.

The average annual recharge to the aquifer was taken to be 0.5 to 5.0 cm. The value 0.5 cm was taken as an estimate for the current climate; and 5.0 cm, one order of magnitude higher, was taken as representative of a wetter climate.

The reference made in the draft EIS to drier and wetter climates suggested a 90% chance for a drier climate and a 10% chance for a wetter climate. What was meant was that there was a 90% chance of climate remaining the same or becoming drier or a 10% chance that it would become wetter over the next 10,000 years. Nevertheless, in Appendix S, where these probabilities were taken into account, the EIS has been revised to add other combinations such as a 50% chance of becoming wetter or a 50% chance of staying the same or becoming drier, and 10%

chance of staying the same or becoming drier and a 90% chance of becoming wetter. It is believed that the climate will in all likelihood remain within known extremes for some time; however, for purposes of analysis the impacts are examined under conditions of a changed climate.

Impacts that might occur as a result of total ineffectiveness of the topsoil layer on the barrier, by whatever means including loss of vegetation and wind erosion in a drier climate, can be approximated as follows. In the disruptive barrier failure scenario presented in the draft EIS, the barrier was assumed to fail such that 10% of the waste was reached by 50% of the average annual precipitation (15 cm/yr) when the regional average annual recharge was 5 cm/yr. A recharge of 15 cm/yr represents about the average annual precipitation in the area of interest at present and thus would represent a conservative estimate of the infiltration in a drier climate. The number of health effects for 100% (rather than 10%) disruptive failure could then be approximated as 10 times those reported for the disruptive barrier failure. That calculation leads to the following results for downstream users of the Columbia River over 10,000 years: 0, 3, 2, and 3,800 health effects for the geologic, in-place stabilization, reference and no disposal action, respectively. Those values may be compared to 0, 0, 0, and 3,800 presumed health effects for the geologic, in-place stabilization, reference, and no disposal action, respectively, where barriers remain effective.

3.5.6.2 Comment:

A reviewer commented that, although the draft EIS recognizes that a drier and windier climate could increase wind erosion, it does not explain that this climate change could actually increase infiltration. The reviewer felt that it is important to state that precipitation in dry climates occurs as a few brief but intense events that saturate the top soil, leading to a decrease in vegetation and increase in soil erosion with the final result that a greater infiltration may be induced during periods of precipitation (Letter Number: 215).

Response:

There are areas on the Hanford Site now (not near the waste sites, however) where surfaces are covered by sand dunes. Vegetation does not take hold there, and infiltration of precipitation is thus predicted to be substantially higher than in vegetated areas. However, where there is top soil it seems that vegetation grows to make use of any moisture available. It is recognized that precipitation that occurs outside of the growing season may not be available to plants unless it is retained near surface. On the other hand, to achieve such conditions one would expect substantially less than present levels of precipitation. Lower levels of precipitation would cause a drop in the groundwater level, making the pathway of wastes to groundwater longer.

As a bounding approximation to the impacts of barrier loss, by whatever means, a factor of ten could be applied to the impacts presented for disruptive failure of barriers in order to approximate failure of all the barriers (in that scenario 10% of the waste was subject to an infiltration of 15 cm/yr where near-field recharge was 5 cm/yr, a wetter climate than at present). A recharge of 15 cm/yr represents essentially the total present average annual precipitation. Based on the described scenario, the calculated result among downstream users of the Columbia River over 10,000 years would amount to 0, 3, 2, and 3,800 health effects for the geologic, in-place stabilization, reference and no disposal action alternatives, respectively. Those values may be compared to 0, 0, 0, and 3,800 calculated health effects for the geologic, in-place stabilization, reference, and no disposal action alternatives, respectively, where barriers remained effective.

3.5.6.3 Comment:

A reviewer commented on Section S.5 that the composite release-ratio/probability curves show that the in-place stabilization and disposal alternative and the reference alternative meet the EPA standard at the 99.9 percentile. This conclusion is not adequately supported (Letter Number: 239-NRC).

Response:

Section S.5 has been revised to clarify the intention regarding future climate. As used in that section, 90% drier climate referred to either the current climate or a change to a drier climate. The text made it appear that a change was inevitable and that it would be most probably to a drier climate. Because any predicted change is for the most part speculative, that part of the analysis was treated parametrically. As a consequence, two additional scenarios have been added, 1) a 50% chance of either remaining the same or becoming drier and a 50% chance of becoming wetter; and 2) a 10% chance of remaining the same or becoming drier and a 90% chance of becoming wetter. The results of these analyses are presented in Appendix S.

Flooding

3.5.6.4 Comment:

A reviewer noted that a 100-year flood scenario is presented in Appendix R; yet its effects are not mentioned (Letter Number: 177).

Response:

The 100-year flood scenario results in an estimated flow rate substantially less (13,000 m^3/s) than that for the larger floods, about which it was stated in Section 4.4.1 that the floodwaters would not reach to waste sites (probable maximum flood: 40,000 m^3/s). A statement to that effect has been added to Section 4.4.1 of the final EIS.

3.5.6.5 Comment:

Reviewers felt that an in-depth discussion of floods in relation to the Hanford Site was lacking in the EIS.

More specifically, another reviewer noted that in Appendix R (page R.93), the cumulative impacts of lava flow or mudflow (lahar) damming of the Columbia River Gorge and subsequent flooding of the Hanford Site are not evaluated (Letter Numbers: 74, 231, 234).

Response:

As stated in Section 4.4.1, the 200 Areas waste disposal site is above 152 m and the height of the maximum probable flood (40,000 m^3/s) would be about 129 m. At the 618-11 waste site, near the Washington Public Power Supply System (WPPSS) Hanford Number 2 Plant, where the elevation is about 130 m, the water from the probable maximum flood was estimated to reach 120 m (note that in the reference and preferred alternatives the waste is exhumed from the 618-11 site and taken to the 200 Areas for processing with the TRU waste component disposed of in WIPP). Thus, water from the probable maximum flood would not reach the waste. Since the flow rate of the maximum historical flood (21,000 m^3/s) was about one-half of that of the probable maximum flood, waters from a recurrence of the maximum historical flood would not reach the waste sites.

Because the 200 Areas waste sites are many miles from the flooded areas and are well above groundwater and because the floods are of relatively short duration, the impacts of these floods on groundwater are believed to be insignificant with respect to increased heights of groundwater and dissolution of wastes.

It seems reasonable to assume that the Columbia Gorge damming event would be managed by human intervention to minimize flooding and other potential hazards to cities at lower elevations than the Hanford 200 Areas.

3.5.6.6 Comment:

Reviewers took issue with the scenario for destruction of Grand Coulee Dam that was postulated in the draft EIS, in which flood estimates were made based on losses of 25% and 50% of the Grand Coulee Dam as a result of nuclear detonation. It was felt that 100% failure of the dam could be possible under these conditions, and that flood impacts should be analyzed for total failure of the Grand Coulee Dam.

Another reviewer expressed concern about the impact of major floods on N Reactor and the WPPSS nuclear facilities.

Other reviewers were concerned that the DOE is relying too heavily, perhaps exclusively, on the upstream dams to prevent flooding of the Site rather than working to make Hanford Site facilities and waste storage sites flood-proof (Letter Numbers: 57, 74, 171, 178, 215, 219).

Response:

As stated by the Energy Research and Development Administration (ERDA) (1976), in 1950 the Atomic Energy Commission requested the Chief of Engineers, U.S. Army, to conduct a study of the impacts at Hanford should a major breach of Grand Coulee Dam occur. Established in that study were two floods that have become known as Artificial Floods I and II, now established at 150,000 m^3/s and 230,000 m^3/s in the vicinity of N Reactor. These floods were calculated to result from breaches of the dam caused by detonations of nuclear devices. No natural sequence of phenomena could be postulated to cause such floods. In the former case, it was hypothesized that 25% of the total dam would be instantaneously evaporated from its center section. In the latter case, it was 50% of the dam. Instantaneous removal of the total Grand Coulee Dam structure was not considered credible. If the flow of the Artificial I flood were to occur, the cities of Richland, Pasco, Kennewick, and Portland would be devastated. Water would be about 18 m deep in Richland and 8 m deep in downtown Portland. The impact of the Artificial II flood would be substantially worse.

Section 4.4.1 of the final EIS contains the following statement "The likelihood that floods of this magnitude (21,000 m^3/s), would recur has been reduced by the construction of several flood control/water storage dams upstream of the Site." The 1894 flood (21,000 m^3/s) was without flood control or water storage dams. The probable maximum flood (40,000 m^3/s), which assumed twice that flow, did not reach the waste sites. Therefore, it is incorrect to assume that DOE is relying on existing dams for protection of waste storage or disposal sites.

Impacts of dam failures on N Reactor and the WPPSS Hanford Number 2 Plant are not within the scope of the EIS.

3.5.6.7 Comment:

Reviewers commented that the potential for flash flooding of the waste sites from Cold Creek was inadequately analyzed with respect to the probable maximum flood, contamination impacts from flooding of onsite ephemeral streams and waste ponds, and Executive Order 11988, "Floodplain Management." A table or figure showing peak flows was requested (Letter Numbers: 5-DOI, 60, 231, 234, 239-NRC).

Response:

The study referenced in Section 4.4.1 suggested that flood water from the probable maximum flood associated with a flash flood on Cold Creek might reach the southwest corner of 200 West Area. Some soil sites contaminated by transuranics (TRU) and suspect TRU-contaminated solid-waste burial grounds are in, or adjacent to, that part of the Site as a result of past disposal actions. None of the EIS disposal options call for additional disposal in that portion of the 200 Area. Concern that the probable maximum flood cited is not a well-defined upper bound for flash floods on Cold Creek, as stated in Section 4.4.1 of the final EIS, has prompted a further appraisal of the potential for, and magnitude of, flash floods.

Executive Order 11988 (ANS 1981) defines flood plain as "... the lowland and relatively flat areas adjoining inland and coastal waters including flood prone areas of offshore islands, including at a minimum, that area subject to a one percent or greater chance of flooding in any given year." That was interpreted to be the 100-year (Cold Creek) flood examined by Skaggs and Walters (1981), which corresponds to an elevation of about 191 m, whereas the southwestern corner of the 200 Areas is at an elevation of about 195 m. Thus, the flood plain from the 100-year Cold Creek flash flood does not appear to be within the definition of flood plain relevant to Executive Order 11988.

The statement on p. 1.14, "The potential for flash flooding is remote," has been revised in response to the comment. Also, a table showing peak flows has been added to Appendix R. Additional details are presented in Section 4.4.1.

Flash flooding as a source of recharge water of possible significance in terms of impacts from pre-1970 TRU waste sites in the southwestern corner of 200 West Area will be evaluated along with other considerations of remedial action for those wastes.

3.5.6.8 Comment:

Reviewers commented that the return of a glacial climate would result in catastrophic floods (like the Missoula flood) that could wash out the alluvium of the Hanford Site and change the position of the Columbia River, removing part or all of the buried waste tanks, the reactors, and the PUREX Plant. Large concentrations of wastes could occur at the surface of the basin; also, some of the waste could conceivably be carried through Wallula Gap (Letter Numbers: 60, 74, 156, 171, 177, 215, 219).

Response:

Initially it was thought that the most likely fate of wastes in sediments would be removal and transport through the Wallula Gap with the flood waters of a Missoula-type glacial flood.[a] Additional study suggested that the most likely effect would be reworking of the sediments in the Pasco Basin (Craig and Hanson 1985). As presented in the draft EIS, there was no near-surface disposal of vitrified, high-level waste; hence a glacial flood would not exhume pieces of glass. The grouted waste would in all likelihood have disintegrated in the 40,000 to 50,000-year time frame in which the glacial floods are postulated and would probably not exist as large pieces.

The concern that impacts might be greater if the wastes were distributed over the Tri-Cities areas and downstream is believed to be unwarranted. If the distribution of wastes were over an area 6 by 13 km in prime farm land, the dose estimate would be the same as presented in Section 3.4.2, namely, a life-time dose of 0.3 rem. Moreover, the farther the wastes are moved, the larger the volume within which they would likely be distributed, and, thus, the smaller the expected impacts.

3.5.6.9 Comment:

A reviewer noted that, while the release of nuclear waste would at first be less devastating than the catastrophic event that released it, the effects of radioactive nuclides would outlast the effects of a large glacial flood (Letter Number: 177).

Response:

The event apparently referred to was the recurrence of a glacial flood, which, according to the draft EIS, would result in effects that would overshadow any effects from the radioactive waste that was exhumed. In that scenario, the flood was assumed to occur at about 40,000 to 50,000 years after disposal. By that time, the initial inventory of plutonium-239 would have decreased by two half lives or by a factor of one-fourth, and the cesium and strontium would have essentially disappeared. However, it is not just the inventory of radioactive material that is important but also the concentration at which it may appear in the environment. The flood would cause devastation all along the Columbia River. It was postulated that the plutonium (the principal radionuclide remaining) would be "reworked" (mixed) into the sediments of the Pasco Basin. The "reworking" would in all likelihood

(a) R. G. Craig. 1983. "Analysis of Ice-Age Flooding from Lake Missoula." Unpublished report, Kent State University, Kent, Ohio.

distribute the plutonium in much larger volumes of sediments than the original disposal. If it were not reworked, it would likely be distributed in sediments along the Columbia River or in the Pacific Ocean in even smaller concentrations. The analysis given in Section 3.4.2.2 was intended to show that if the plutonium-239 were to be reworked and to remain in as small a volume as the top 4 m of the waste disposal area, the radiological impact on someone farming that land would be small compared to the radiological impact received from natural background.

There is no basis for prediction of a catastrophic flood in the 5,000-year time frame suggested in the comment. However, if such an event were to occur, the radiological impacts would be on the order of four times those reported in Section 3.4.2.2. Most of the waste that is "highly radioactive" (e.g., strontium-90 and cesium-137) is relatively short-lived and as a consequence would have decayed away in less than 1,000 years.

3.5.6.10 Comment:

A reviewer commented that there was an apparent inconsistency in Chapters 3 and 4 of the EIS concerning the timing of major flooding of the 200 Areas plateau (Letter Number: 223).

Response:

There is no inconsistency between the flood times given in Chapters 3 and 4. The 40,000- to 50,000-year values given in Chapter 3 are the estimated intervals between glacial floods. The 13,000-year value in Chapter 4 is the time since major glacial floods occurred in the 200 Areas plateau, and is not meant to imply that major flooding and erosion would be expected on a frequency of 13,000 years.

3.5.6.11 Comment:

One reviewer had the following comments. The DOE concludes that proglacial catastrophic flooding would be the most probable disruption scenario associated with potential climate change that could significantly affect the hydrologic system. Because this catastrophic flooding was associated with the late ablation phase of continental glaciation, the NRC agrees that it is not likely to recur over the next 10,000 years. However, other consequences of either significantly warmer or cooler climatic trends have not been discussed by the DOE. For example, smaller-scale climatic variations may result in future channel migrations of the Columbia River and its tributaries in response to increasing discharges and sediment loads fed by meltwaters from reactivated mountain and valley glaciers. Mountain glaciers presently exist in the northern part of the Columbia River drainage basin. These could be reactivated and subsequently ablated in response to relatively small-scale climatic changes. If future channel displacements of the Columbia River occur within the Hanford Site, they could significantly change radionuclide transport conditions. Overall, the reviewer believes that the potential for both cooling and warming trends, and the consequences thereof, should be more closely examined by the DOE (Letter Number: 239-NRC).

Response:

Channel migration of the Columbia River (as a result of cooling or warming trends) that might affect mountain and valley glaciers was not analyzed. This decision was based on the present judgment of surface-water hydrologists that within the Pasco Basin the Columbia River lies in an armored fixed-bed channel with little chance of significant lateral movement even under the probable maximum flooding conditions (4×10^4 m^3/sec water flow).

3.5.6.12 Comment:

Reviewers noted that the U.S. Army Corps of Engineers earlier considered possible construction of a Ben Franklin Dam; however, there is no indication in Section 4.4.1 that the plans for that dam have been eliminated (Letter Numbers: 5-DOI, 223).

Response:

The statement "No construction schedules or dates are published, since the U.S. Army Corps of Engineers is not actively considering the dam site" has been added to Section 4.4.1 of the final EIS. If at some future time the project is reconsidered, an EIS would have to be prepared that would discuss, among other issues, impacts of dam failure. There are no "100 Areas" sites for waste disposal within the scope of this EIS.

Intrusion/Barrier Failure

3.5.6.13 Comment:

A reviewer had the following comments. Volume 2, xli: On Figure 3 (Potential Exposure Pathways), there is no pathway illustrated from the buried waste to burrowing animals to man. Burrowing animals may transport the buried waste to the surface, which then may either directly or indirectly impact man, through either inhalation or uptake by crops that may be grown on the contaminated soil. This has been an important pathway in the 200 Areas in the past. Given the uncertainties of the barriers, if you are going to include shallow root vegetation in the pathway then animal intrusion must be added as well (Letter Number: 223).

Response:

See Comment 3.5.5.4.

3.5.6.14 Comment:

Reviewers noted that none of the failure scenarios includes more than one cause of radiation release. Once a site is damaged, it is much more susceptible to conditions that would not significantly affect an undamaged site (Letter Numbers: 171, 177).

Response:

The drilling/excavation with full-garden scenario considered a release event that might be followed years later by an individual or family moving on to the contaminated ground and growing their foods in the contaminated soil. Other examples of compound or consecutive failure and release scenarios include climate change followed by barrier failure and water intrusion were not considered per se. The analysis of the disruptive barrier failure scenario bounds such situations (e.g., where the barrier was drilled through and the waste penetrated, which then promoted erosion of the vegetated soil layer, which in turn allowed water to infiltrate the waste). Erosion would likely be more of a problem in the no disposal action alternative, where the 5 m of basalt riprap is absent.

3.5.6.15 Comment:

One reviewer, commenting on Chapter 3, argued that a number of barrier-disruptive events that the EIS describes as "low probability" are, in fact, not low probability, not even in combination (Letter Number: 223).

Response:

The failure scenarios have been analyzed deterministically with a probability of occurrence of unity. In any case, the probability of occurrence of the events leading to barrier disruption cited in Section 3.4.2.2 is not important to the analysis that follows. Reference to the probability of these events has been removed from that section.

3.5.6.16 Comment:

A reviewer felt that it is not clear why the analysis of chemical contaminant migration was not performed under the scenario(s) of barrier failure (i.e., higher recharge flux). Without this analysis, the assessment of impacts under this scenario is incomplete (Letter Number: 215).

Response:

Estimated concentrations of selected chemicals in groundwater were presented in Tables 3.21 and 3.22 and summarized in Table 3.28 for the disposal alternatives, where the barriers remain effective; and for the no disposal action, where no barriers exist. Concentrations of chemicals in groundwater in the event of barrier failure in the disposal alternatives would be on the order of (but less than) those shown for the no disposal action alternative (tank wastes are in liquid form in the no disposal action alternative and are in solid form in all disposal alternatives; the latter case would result in slower releases and smaller concentrations). Reference to such an approximation has been added to Section 3.4.2.3.

3.5.6.17 Comment:

A reviewer commented that no basis was provided for the assumption that resettlement of the site would not be realistic under the no disposal action (Letter Number: 223).

Response:

The DOE intends to maintain active institutional control of the Hanford Site indefinitely, to ensure the protection of the public. While it is recognized that the United States itself is less than 300 years old, there is no reason to assume the government will absolve itself of its responsibility for nuclear waste management. Even though the Hanford Site has been safely maintained for over 40 years to date, the DOE wants to proceed with permanent disposal due to the very uncertainties the commentator is concerned about. Notwithstanding, a resettlement scenario was analyzed assuming loss of institutional control after 100 years following disposal.

3.5.6.18 Comment:

Reviewers commented concerning the National Primary Drinking Water Regulations in 40 CFR 141, and noted that although no public water system currently exists on the Hanford Site, many of the alternatives discussed possible resettlement of the Site. In light of that potential, the reviewers suggested that the statement in Section 6.4 be revised to imply that future water systems could be located on the Hanford Site for the public. Some apparent contradictions between Table 2, water concentrations out of DOE Order 5480.1B (DOE 1981), and the Interim Drinking Water Standards were pointed out, and it was suggested that the most conservative should apply. It was also felt that a reasonably conservative approach should assume that groundwater at Hanford may be used for drinking water in the future (Letter Numbers: 215, 223).

Response:

In the analysis of impacts among the alternatives it was assumed (in accord with 40 CFR 191) that groundwater in the unconfined aquifer on the Hanford Site was a "significant source of groundwater" but was not a "special source of groundwater" serving thousands of people (see definitions at 40 CFR 191.12). Accordingly, comparisons were made to the 25 mrem/yr dose limit from all pathways over the first 1,000 years after disposal under undisturbed conditions for such water. Although 40 CFR 141 is not currently applicable, it has no time limit (as has 40 CFR 191); hence it might apply to water supplied by a community water system at some time in the future. Compared to the 40 CFR 141 limit of 4 mrem/yr indicate that none of the alternatives as described would meet that limit for all time (e.g., geologic disposal would yield 7 mrem/yr from grouted process residuals after about 5,000 years of disposal).

With respect to the concentration guides, the limit for strontium-90 is essentially the same in DOE Order 5480.1A as in 40 CFR 141. The limit for tritium is about 70,000 pCi/L for 4 mrem/yr in DOE Order 5480.1A and 20,000 pCi/L in 40 CFR 141. A proposed revision to 40 CFR 141 (51 FR 34836, 9/30/86) raises the limit to 90,000 pCi/L, in essential agreement with the DOE value.

The DOE dose and concentration limits are being revised in accordance with the change in dosimetry basis provided by ICRP 26 and 30 (but not in time to be used in this EIS). Based on ICRP 26/30 dosimetry, some permissible concentrations will increase and some will decrease.

3.5.6.19 Comment:

A reviewer noted that the draft EIS reported that by 1,000 years, the radiation dose to drillers would be less than 0.01 rem/yr for all classes of waste. The reviewer wanted to know whether this calculation includes the possibility of inhaling particulates from excavation into transuranic waste (Letter Number: 223).

Response:

The dose calculations take into account inhalation of particulate matter.

3.5.6.20 Comment:

A reviewer noted that with respect to drilling and major excavation intrusion scenarios, the basis for resuspension rates as well as mass loading rates should either be referenced or discussed (Letter Number: 215).

Response:

The final EIS has been revised in Section R.5.3 to provide the basis for mass loading and resuspension rates.

3.5.6.21 Comment:

A reviewer noted that the draft EIS concludes that the only important pathway for radionuclides and complexants to the affected environment is via groundwater, but does not indicate that radionuclides could also be transported to the affected environment through disturbance of contaminated soils as a result of waste retrieval activities or possible repository construction/operation (Letter Number: 215).

Response:

Airborne transport of nuclides as a result of disposal activities was taken into account and included in Section 5.2.2 (Volume 1) for the geologic disposal alternative and parallel sections of Chapter 5 for the other alternatives. Section 5.2.4 relates specifically to impacts in the long term.

3.5.6.22 Comment:

A reviewer noted that the draft EIS assumes that a driller will spend 40 hours at the site, drilling through the wastes. The reviewer felt that it is misleading to average that exposure over 1 year (as described in Table R.51 of the draft EIS for occupational accidents). A large exposure over a short time period (sub-acute to acute exposure) has markedly more severe physiological impacts than that same exposure averaged over 1 year (sub-acute to chronic) (Letter Number: 215).

Response:

The majority of the dose is from external sources and is received during the 40-hour drilling period. Doses from inhalation of radionuclides would involve some prompt exposure but would also include exposures over a longer time as a result of translocation within the body. The doses reported in Table R.51 include the total dose the body receives in 1 year. The doses reported are on the order of the dose that one would receive from a medical x-ray (20 mrem), and the time over which it was received is not important. Where duration is important, it is taken into account in estimating effects.

3.5.6.23 Comment:

A reviewer noted that the drilling scenarios do not include opening a direct recharge pathway from the surface through the wastes and more rapid movement of contaminants to the water table (Letter Number: 215).

Response:

It would be expected that only a small quantity of waste (that immediately surrounding the "hole") would be affected. The disruptive barrier failure is believed to be substantially more significant in terms of effects, and bounds the reviewer's suggested scenario.

3.5.6.24 Comment:

A reviewer noted that the draft EIS considers two possible barrier failure scenarios and calculates the additional dose to the downstream population as a result of failure of a barrier for a single waste burial site for each scenario. It is possible that more than one waste burial site may fail over 10,000 years, resulting in a larger radiation dose than calculated (Letter Number: 215).

Response:

The barrier failure scenarios are based on percentages of waste rather than on numbers of waste sites. Thus 10% of the barriers over each of the waste classes are assumed to be disrupted, and 50% of the barriers over each of the waste classes are assumed to be functionally defective. The impacts of these failures are given as increments over that which would be estimated where barriers functioned as designed.

3.5.6.25 Comment:

A reviewer noted that Table R.47, comparing effects of the various disposal alternatives on the Columbia River, does not specify whether barrier failure scenarios have been incorporated; if not, then the apparent similarity between consequences of geologic disposal and consequences of the in-place stabilization and reference alternatives is further exaggerated (Letter Number: 223).

Response:

The barrier failure scenarios are included in Table R.47. These data were included by waste class and alternative in Table 3.10 as well.

3.5.6.26 Comment:

A reviewer disagreed with the assumption that the barrier and marker system would be adequate to prevent inadvertent intrusion into wastes disposed of near surface, and suggested that the consequences would resemble those of the no-action case should intrusion actually occur (Letter Number: 240).

Response:

Because of large amounts of capital and operating funds placed at risk for a major excavation and the presence of land use records, markers around and within the barriers and the barriers themselves, the DOE believes that a major inadvertent excavation, involving large earth-moving equipment, through the 17-foot riprap/soil barrier and into the waste some 20 feet below is not credible. On the other hand, drilling scenarios (not unlike excavations striking gas pipelines) were examined for the disposal alternatives as likely examples of inadvertent intrusion into waste sites.

If a major excavation event were to take place that involved the same single-shell tanks under the in-place stabilization or no disposal action alternative, the impacts would not be expected to be substantially different.

Irrigation/Wells

3.5.6.27 Comment:

A reviewer noted that in Appendix Q (Vol. 3, Sections Q.8 and Q.9) the draft EIS assumes that the 200 and 300 Areas would never be irrigated. Such an assumption may not be warranted for the far distant future if extreme climate changes are presumed (Letter Number: 217).

Response:

The assumption that the waste disposal sites would not be irrigated is based partially on the expected effectiveness of the monument and marker system, the presence of barriers, the severe limitations of the soils for agriculture and, for the 200 Areas in particular, the economic considerations associated with the long distances and high lift necessary to move sufficient water onto the plateau. The only survey of the Hanford Site was performed by Hajek (1966). Most of the soils were found to be Class IV, indicating that there were severe limitations for permanent cropland use.

3.5.6.28 Comment:

A reviewer noted that a potentially major impact on contaminant migration into the accessible environment could result from offsite irrigation. This impact would stem from reductions in vadose zone thickness and associated substantial reductions in contaminant travel times. While the draft EIS Section R.1.2 indicates that offsite irrigation was addressed in Appendix Q, the significant results of the offsite irrigation scenarios apparently have not been quantitatively incorporated in any of the analyses of long-term performance of waste disposal systems (Appendix R) or of probability and consequence analysis of radionuclide release and transport (Appendix S) (Letter Number: 223).

Response:

As developed from Appendix Q, the reduction in vadose thickness would be by factors of about 1.3 to 2.5 for wastes in 200 East and 200 West Areas, respectively, as a result of the groundwater elevations assumed average annual recharges of 0.5 and 5.0 cm/yr. Thus, some reduction in travel time through the vadose zone would be expected. Reduction in travel time is important, however, for only the first 500 years or so. After that time, all the remaining radionuclides would be sufficiently long lived that such differences in travel times would not alter the resulting concentrations significantly. Moreover, the increase in groundwater elevation would provide for a larger volume of water within which to dilute the wastes. The decrease in concentrations by reason of additional dilution would be by factors of about 3,500 and 4,500 for the 15 cm/yr and 30 cm/yr irrigation-enhanced recharges, respectively. On balance, then, irrigation off site might be beneficial in terms of concentrations of waste nuclides in groundwater and does not appear to aid in forming a basis for decisions among the disposal alternatives.

3.5.6.29 Comment:

A reviewer commented that intrusion scenarios are not conservative individual farm scenarios. The water drawn for irrigation purposes could come from areas closer than 5 km from the waste. Further, produce could be shipped out to contact many people, as is presently the case with crops grown locally. Therefore, impacts have very likely been underestimated (Letter Number: 215).

Response:

The distance of 5 km from the waste for the nearest well is in compliance with EPA standard 40 CFR 191 (a well just outside of the control zone whose boundary may be no more than 5 km from the original location of the waste). In any event the dose estimates for closer wells would not be significantly different from those postulated at greater distance because the travel time within the aquifer to any point on the Site is short (thus with little additional nuclide decay) compared to the travel time in the vadose zone above.

In the scenario presented, the entire crop production was consumed by the local farmers and their families. That maximizes individual and population dose estimates. The total population dose remains the same because the total quantity of radioactive material is consumed regardless of the number of consumers.

3.5.6.30 Comment:

A reviewer noted that Appendix S appears to disregard the offsite irrigation scenarios, which could significantly accelerate contaminant releases to the accessible environment under several disposal alternatives (Letter Number: 223).

Response:

Groundwater levels could conceivably be raised by offsite irrigation, but not enough to affect the analysis of Appendix S significantly. Furthermore, Appendix S implicitly accounts for raised water levels by using shorter water travel times for recharges greater than 5 cm/yr. See also Comment 3.5.6.28.

Seismicity

3.5.6.31 Comment:

Reviewers were concerned about seismic activity on or near the Hanford Site.

Response:

See comment 3.2.2.3.

3.5.6.32 Comment:

Reviewers noted that further study is also needed concerning seismology; a 135-year earthquake record is not a sufficient data base on which to conclude that there will be little or no seismological activity at Hanford for 10,000 years. Another reviewer was concerned that seismic activity could fracture the basalt, causing leakage of waste to the groundwater (Letter Numbers: 155, 171, 177, 231, 234).

Response:

The seismicity (seismic hazard) on the Hanford Site is considered relatively low because of the history of "small" earthquakes (3 to 5 magnitude) in and around the area. The Columbia Plateau is considered a region of "moderate" seismicity, since one earthquake registering 5.75 on the Richter Scale did occur in 1936 near Milton-Freewater, Oregon. "Moderate" signifies that, according to the historical record, earthquakes with magnitudes of 5 to 7 have occurred. A 135-year record is scant compared to 10,000 years. Other sites in the country may have records up to 200 years longer, but those also are scant compared to 10,000 years.

The plate boundary nearest the Hanford Site is the Juan de Fuca North American plate boundary, which occurs several hundred miles to the west, off the coast of Washington. The subducted ocean crust extends eastward beneath Puget Sound but is not known to extend beneath the Hanford Site. Available geologic, geodetic, and seismologic data have been interpreted to indicate that deformation under nearly north-south, nearly horizontal compression began at least 15 million years ago in the Miocene Epoch and is continuing today. This stress regime is responsible for the development of the Yakima folds and associated faults, the microseismicity currently observed, and the strain being measured by geodetic surveying. Development rates of geologic structures appear to be geologically low (involving long geologic times), leading to relief of stress and strain via earthquakes of long recurrence times. Regardless of pressures as a result of tectonic movement, it would seem that any of the disposal alternatives would afford greater environmental protection from Hanford defense waste than would continued storage.

3.5.6.33 Comment:

A reviewer noted that many of the DOE's charts and graphs in the EIS omit the location of established earthquake faults and misrepresent the spatial relationship of surface aquifers and the Columbia River to the proposed disposal sites (Letter Number: 201).

Response:

The best available summary information on the location of faults, surface aquifers and the Columbia River with respect to the waste disposal sites was provided in Chapter 4, Sections 4.3 and 4.4, respectively. Figure 4.5 has been updated in the final EIS to show existing faults in the Columbia Plateau. The spacial relationships of surface aquifers and the Columbia River are shown in relationship to the proposed waste sites in Figures 4.5 and 4.8 of the EIS.

Other Disruptive Events

3.5.6.34 Comment:

A reviewer noted that "extreme scenarios like nuclear war" have been set aside in favor of "more realistic" scenarios. The reviewer "feels that nuclear war is very much a possibility" and asked why DOE is producing more weapons-grade plutonium, if nuclear war is not "realistic" (Letter Number: 216).

Response:

The effects of nuclear war on Hanford defense waste would not appear important in contrast to the effects of the war itself. Therefore, analyses of such a scenario would not better enable determination of the preferred course of waste disposal.

3.5.6.35 Comment:

Reviewers commented that DOE should not dismiss some "catastrophic" accident scenarios such as a giant meteorite, flood, volcano, etc; such natural events have occurred numerous times throughout history (Letter Numbers: 11, 156, 231, 234).

Response:

Volcanoes are not expected to lead to releases. Meteorite impacts have such a low probability, they were not analyzed, in accord with guidance in 40 CFR 191. Flood releases, with the exception of glacial floods, would not reach the wastes. In the event of glacial flooding, it is expected that the waste-bearing sediments would be worked and would remain to a large extent in the Pasco Basin. See also Comments 3.5.6.8 and 3.5.6.9.

3.5.6.36 Comment:

Reviewers noted that the draft EIS does not provide a complete listing of all postulated natural and man-induced events that may impact waste disposal. Future impacts from three naturally occurring events were considered, although the DOE claims that "numerous postulated events were reviewed." A complete listing of all possible postulated events and their consequences should be included, with a brief explanation for exclusion from consideration (Letter Numbers: 171, 215).

Response:

The list of natural events requested by the reviewer appears on page R.2 in Table R.1. The purpose of Section 3.4.2 is to provide for comparison of impacts among the alternatives; details appear in the appendices.

3.5.6.37 Comment:

A reviewer noted that lava flows and volcanism might be beneficial in that they may create additional cover over the wastes; however, the possibility should be considered that such events might raise the water table, because of compaction of the underlying soil, so that it comes in contact with the buried wastes. Volcanism such as exhibited by Mt. St. Helens suggests that the area is unstable and unsuitable for waste disposal (Letter Numbers: 5-DOI, 202).

Response:

Except for seismic events, it is believed that there has been no significant change in the sediments of the 200 Areas plateau within the last 13,000 years since the sediments were laid down in the aftermath of the Missoula flood. Assuming that the water table had returned to its pre-1943 level at the conclusion of waste disposal, there would be on the order of 60 to 80 m of sediments between the waste and the water table. Lava flows or ash fall from volcanism would, as suggested, increase the thickness of material overlaying the wastes and provide additional protection. Because the sediments between the wastes and groundwater are extremely thick, it seems unlikely that compaction from lava or ash fall could result in contact between the waste and groundwater.

3.5.6.38 Comment:

Reviewers commented on Section R.8 of the draft EIS, stating that the assumption of 0.025 mm/yr is nonconservative with respect to wind erosion of the proposed protective barrier, given the much greater rates observed elsewhere and considering the barrier's fine surficial soil texture, elevated position in the landscape, and limitations on any type of armoring system to limit erosion (Letter Numbers: 171, 223).

Response:

That portion of Appendix R dealing with wind erosion has been modified with respect to barrier performance to be in accord with Appendix M. Appendix M admits to a lack of quantitative measure of erosion rates at the area of interest and to the need for additional research on selection of soils, rock armoring and vegetative cover. It also notes that there may be a net accumulation of windblown soil over time.

The conclusion remains that "wind erosion is not seen as a discriminator for choice among disposal alternatives." However, because of the lack of quantitative data, wind erosion will be studied under the Barrier Development Program (Adams and Wing 1987).

3.5.6.39 Comment:

In the summary of the draft EIS, a reviewer noted that in-place stabilization and disposal and in some respects the geologic and reference alternatives present disposal scenarios in which all or some of the high-level and low-level wastes would remain buried near surface; consequently, the waste may be subject to near-surface natural phenomena (Letter Number: 215).

Response:

Various phenomena that might affect waste disposed of near-surface were identified in Appendix R. Impacts that might be associated with protective systems provided for such near-surface disposal were developed and presented in Chapters 3 and 5.

Modeling

3.5.6.40 Comment:

A reviewer requested that more data be collected concerning groundwater flow and groundwater contamination risks resulting from activities over the very long term, such as seismic events, flooding, climatic changes, drilling for gas and other resources, and increased human and animal activity (Letter Number: 64).

Response:

The level of information provided was sufficient to obtain direction for the waste disposal effort. The preferred alternative takes into account aspects of waste disposal where uncertainty exists and makes provision for additional research and development and further agency and public review.

3.5.6.41 Comment:

Reviewers raised questions and comments about past waste disposal activities and current waste disposal efforts at the Hanford Site. 1) At the Hanford Site, four cribs, one trench, one French drain, one tank leak, one reverse well, and one disposal pond have been characterized. Why were these sites selected? 2) If only nine sites out of 200 have been characterized, can an effective EIS be written? 3) Could a map of the locations of all the disposal sites and a table showing chemical makeup of the disposal sites be provided? 4) Because wells are generally not valid for monitoring water in the vadose zone, other methods such as suction lysimeters are recommended. 5) Were wells that were drilled in the 1940s to 1960s completed to QA/QC standards? How valid are the data? 6) Until the geohydrology of each disposal site is fully understood, the prediction of impacts is questionable. Analysis of the cumulative impacts from the disposal sites should be based on field testing data (Letter Numbers: 231, 234).

Response:

1) These sites were chosen because operations data showed that they had received more than 100 nCi/g TRU or more than 80 g of plutonium over 100 m^2. The sites are representative of other TRU sites and therefore provide a valid reference description for impact analyses.

2) Impact assessments presented in the EIS are based on an analysis of total inventories, which are more accurately known than the individual site inventories. The impacts from all the TRU sites are bounded by estimations of total inventory impacts based on site descriptions similar to the reference or characterized sites. Therefore, since the estimated impacts represent a valid upper bound for total impacts, the EIS is judged to be effective.

3) General locations have been indicated. Exact locations of the waste sites would not enhance the comparison of the impacts of the defense waste disposal alternatives. Known chemical makeup data have been presented. More details can be found in RHO-RE-ST-30 P (Rockwell 1985) and RHO-RE-ST-30 ADD P (Rockwell 1987).

4) Wells are valid for monitoring the unsaturated zone, using scintillation and neutron probes. Suction lysimeters are not reliable in dry sands typical of the Hanford Site.

5) Wells drilled in the early years of Hanford operations were not drilled under current strict quality-control/assurance standards but were subject to standards applicable at the time. Wells are routinely inspected, maintained and replaced as necessary.

6) The DOE believes that the data available were adequate to perform the impact assessments presented in the HDW-EIS. Additional radioactivity and chemical data will be collected as necessary to permit site-by-site disposal decisions for those waste classes for which disposal decisions are being postponed according to the preferred alternative.

3.5.6.42 Comment:

A reviewer noted that, with respect to the analysis in Appendix S, the most significant nonconservative assumptions are as follows: 1) consequences of protective barrier failure; 2) recharge rates of 0.5 and 5.0 cm/yr for drier and wetter climates, affecting contaminant release rates and travel times; 3) distribution coefficients (K_d) and related contaminant release rates and retardation factors; and 4) fixed vadose zone thickness (64 m) and associated contaminant travel times (Letter Number: 223).

Response:

The DOE believes that the assumptions used in Appendix S are reasonably conservative and appropriate for the level of analysis intended; that is, an illustration of the method rather than an analysis demonstrating compliance.

3.5.6.43 Comment:

A reviewer noted that in calculating the release ratio consequence for the various alternatives, 11 radionuclides were used and wanted to know if these 11 include all the significant radionuclides; also, the reviewer wanted to know the contribution of the largest excluded radionuclide (Letter Number: 223).

Response:

All significant contributor radionuclides were included in the draft EIS except selenium-79 which was initially not included because of an error in its assigned K_d value. It has been added and discussed in the final EIS. The next largest contributing radionuclide excluded was neptunium-237 which in the worst case contributes 0.036 to C_A (release ratio consequence).

3.5.6.44 Comment:

Reviewers commented that the word "partitioned," used in Appendix S, is not defined. It was felt that the statement "the EPA standard makes provisions for assigning a larger release limit" needs further explanation, by indicating the mechanism and its location in the standards (Letter Numbers: 223, 243-EPA).

Response:

"Partitioned release limits," in general, means to allocate the release limit multiplier as permitted in 40 CFR 191 Appendix A, Note 4: Treatment of Fractionated High-Level Wastes. This Note permits the implementing agency to "allocate the release limit multiplier" for a high-level waste stream, which has been separated into two or more high-level waste components destined for different disposal systems, among the various disposal systems as it chooses, provided that the total release limit multiplier used for that waste stream at all of its disposal systems may not exceed the release limit multiplier that would be used if the entire waste stream were disposed of in one disposal system. Appendix S has been revised to describe this more clearly. Appendix S bases its partitioned release limits on the amount of waste activity that remains on site.

3.5.6.45 Comment:

A reviewer commented that the probability distribution function of K_d values for plutonium should include much lower values (Letter Number: 223).

Response:

The probability distribution of the plutonium K_d already includes very low values. The lowest possible value, of course, is zero. For the low values used, the plutonium transport time is much less than 10,000 years, so no greater release consequence ratio results for a K_d value of zero for the period of interest.

3.5.6.46 Comment:

A reviewer wanted to know what the effect would be on the results of the release consequence model if worst-case assumptions are made regarding the severity of barrier failure, groundwater recharge rates, chemical retardation, and vadose-zone thicknesses, in combination with probabilities of 50% for disruptive barrier failure, 90% for a wetter climate and 10% for a drier climate (Letter Number: 223).

Response:

The reviewer does not define "worst-case" assumptions. However, Appendix S of the EIS has been revised to include combination scenarios of disruptive barrier failure probability and climate change which are considered to be outside the range of credibility.

Figures S.11 and S.12 have been added to Appendix S to show the effect of barrier failure probabilities of 50% and 100%.

3.5.6.47 Comment:

A reviewer noted that, in the probability analysis (Appendix S), the drier-climate scenario is given a 90% probability while the wetter climate is assigned a 10% probability--directly in contradiction to the statements in Appendix R that "it seems most likely that the most probable change will be toward a cooler climate," and "climate is considered under three different conditions, with the largest expected change being toward a cooler and wetter state" (Letter Numbers: 177, 223, 243-EPA).

Response:

There is no contradiction between the two appendices. In Appendix S, "drier" actually represents a continuation of the "current" climate whereas in Appendix R the emphasis is on change toward a cooler, wetter climate. Therefore, Appendix S is saying that if the climate changes (10% probability) the change will be wetter; in complete agreement with Appendix R. For clarity, the term "drier" has been replaced with the term "current" in Appendix S. Also, for comparison, an analysis for a 10% probability of present climate and 90% of wetter has been added to Appendix S.

3.5.6.48 Comment:

A reviewer noted that on p. F.32, the MAXI code results appear less conservative than the NRC results (Letter Number: 215).

Response:

The EIS has been revised to clarify the reason for the difference.

3.5.6.49 Comment:

A reviewer wanted to know whether any Monte Carlo predictions were used to pick the values for a bounding analysis (Letter Number: 243-EPA).

Response:

Appendix S is based on a Monte Carlo analysis with 2000 deterministic calculations.

3.5.6.50 Comment:

A reviewer inquired about the basis for the assumed fuel burnup of 5000 MWd (Letter Number: 243-EPA).

Response:

40 CFR 191 Appendix A, Note 3 provides that "a value of reactor fuel burnup of 5000 MWd/MTHM[a] may be used when the average fuel burnup is below 5000 MWd/MTHM." Hanford fuels were exposed to substantially less than 5000 MWd/t.

3.5.6.51 Comment:

A reviewer noted that sample calculations are needed in Appendix S to show how the values in the tables were calculated (Letter Number: 243-EPA).

Response:

The mathematical theory of the calculations is presented in Appendix S. Details are provided in a report by M. G. Piepho, "PROBCON/HDW: A Probability and Consequences System of Codes for Analysis of Hanford Defense Waste," currently in publication.

(a) Megawatt days per metric ton of heavy metal.

3.5.6.52 Comment:

A reviewer wanted to know how lower K_d values will affect the results of the release consequence models (Letter Number: 223).

Response:

Lower K_d values will, in general, increase the release-rate consequences.

3.5.6.53 Comment:

A number of reviewers were concerned about the assumptions and modeling approaches used in the draft EIS and whether they were really conservative; i.e., did they really bound the impacts that might be realized (Letter Numbers: 110, 206, 215, 216, 223).

Response:

The assumptions and modeling approaches used in the EIS impact analyses are collectively conservative; that is, the calculated impacts are expected to exceed those that might actually be realized. Where definitive data exist, these data are used. Where uncertainties exist, conservative values are used to ensure conservative results. Some examples of conservative modeling approaches are as follows.

Risk reduction factors are assumed in Appendix M and are used to calculate expected impacts and to provide a measure of worth for the elements of the barrier and marker system. Impacts are also calculated and presented where the risk reduction factors for records, markers, etc., are assumed to be unity (that is, all warnings are absent or ignored).

Biological/diffusion transport in the vadose zone beyond the barrier does not control the release rate or movement of radionuclides. Rather, they are assumed to advect (rather than diffuse) to groundwater in a relatively short time. Beyond the barrier there would be no waste radionuclides with which plant roots might interact.

Doses are calculated as specified in EPA's 40 CFR 191--outside the boundary of the control zone and where the boundary of the control zone is no more than 5 km from the original location of the wastes.

The modeling also assumes that a well at a 5-km location intercepts the maximum stream tube from the waste site under consideration. Additionally, the model assumes that the well extracts water from the top 5 m of the unconfined aquifer and that the contaminants mix only in this top layer. Much lower impacts would be calculated if complete mixing were to be assumed through the entire aquifer. Since no lateral dispersion is assumed (a highly conservative assumption) in the stream tube model, there is no concentration difference between a well 5 km downstream and one 10 km downstream. The arrival time for the latter well would be delayed 2 to 3 years over the former; this would cause a miniscule decrease in concentrations at a 10-km well due to decay effects. Ignoring such effects makes no discernible difference to the calculated impacts considering the overall time of arrival is on the order of 1000 years.

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4.0 ORGANIZATION AND PRESENTATION COMMENTS AND RESPONSES

The comments in this chapter pertain to the EIS document itself: its style, organization and clarity, and editorial concerns. Section 4.1 addresses comments dealing with the treatment of issues through the EIS in general; Section 4.2 includes comments on specific EIS sections, paragraphs, figures, and the like.

4.1 GENERAL COMMENTS

4.1.1 Comment:

Several reviewers commented on the clarity and style of the EIS. To some, the EIS was inaccessible and incomprehensible. An example of what was termed "shotgun organizational style" related to health effects, where, in order to determine radiological effects on human health, it was contended that one must winnow through Chapters 1, 3, 5, and Appendix N. Technical terminology was not found to be set out in a framework that meets the "plain language" requirement of 40 CFR 1502.8. The use of end-of-chapter reference lists, rather than footnotes, for specific references was found to be inconvenient. Avoidance of the project-specific or programmatic approach to complex technical and policy issues which are frequently inextricably interrelated, regardless of the class of waste, was requested. One reviewer felt that the size and complexity of this EIS (as well as compliance with CEQ guidelines) necessitates an index (Letter Numbers: 56, 69, 178, 187, 217, 223, 231, 234. Hearing Number: 337).

Response:

The style of the EIS conforms to the Council on Environmental Quality's regulations for preparation of EIS documents. In other words, Chapter 1 must summarize the EIS, impacts among the alternatives are to be compared in Chapter 3, the affected environment described in Chapter 4, impacts for each of the alternatives detailed in Chapter 5, details of analyses or other supporting materials presented in appendices, and so on.

Use of footnotes for specific references is useful in some documents; however, end-of-chapter reference lists allow ready access to all relevant information on individual subjects. Additional cross referencing has been added in the final EIS, and an index is included.

The EIS is both a programmatic and project-specific EIS in that focus for direction of disposal efforts was sought in a programmatic sense and impact analyses of certain facilities (such as a waste vitrification plant) were provided in a project-specific sense. This approach was taken to provide a basis for moving ahead with projects where possible and to establish direction where additional information is required for other waste disposal actions.

4.1.2 Comment:

The term "accessible environment" often appears in the draft EIS. There is some confusion about what it means. The term should have been defined in the draft EIS (Letter Number: 171).

Response:

The term "accessible environment" is defined in EPA's 40 CFR 191 as: 1) the atmosphere; 2) land surface; 3) surface waters; 4) oceans; and 5) all of the lithosphere (the solid part of the Earth below the surface, including any ground water contained in it) that is beyond the controlled area, which means: a) A surface location, to be identified by passive institutional controls, that encompasses no more than 100 square kilometers and extends horizontally no more than 5 kilometers in any direction from the outer boundary of the original location of the radioactive wastes in a disposal system; and b) the subsurface underlying such a surface location. This definition has been added to the glossary.

4.1.3 Comment:

A reviewer noted that all numerical approximations should be rounded off the same way. If 4.6 becomes 5 (because there is only one significant figure), then 1.6 should become 2 and not 1; otherwise, considerable errors are introduced (Letter Number: 217).

Response:

Recognized methods of rounding were used uniformly throughout the EIS. The final EIS has been screened to remove rounding artifacts such as given in the foregoing example.

4.1.4 Comment:

One reviewer pointed out that throughout most of the EIS, PUREX is simply referred to as PUREX, but in Section D.2 it is referred to as A Plant. In addition, Z Plant is listed, which is the Plutonium Finishing Plant, and S Plant implies that REDOX is still active, which is not the case. The reviewer also felt that, along with the nomenclature, the type of product that each plant produces may be beneficial in understanding the kind of waste which would be generated (Letter Number: 223).

Response:

Corrected and uniform nomenclature has been used in the final EIS.

4.1.5 Comment:

One reviewer stated that "reverse well" (page V.20) should be explicitly termed "injection well" to avoid any confusion (Letter Number: 243-EPA).

Response:

The term "reverse well" is used to maintain consistency with historical documents. Since reverse wells (or injection wells) are not used any more at Hanford, a change in terminology is not warranted; however, the section heading has been modified in the final EIS to read "Reverse Wells (Injection Wells)."

4.1.6 Comment:

A reviewer objected to the terms "farm" and "feed" as used in the EIS, asserting that these "life-related" words are inappropriately used in reference to nuclear waste disposal (Letter Number: 170).

Response:

"Tank farm," as used in the EIS, is an extension of the dictionary term: an area with tanks for storage of oil. "Feed" is an extension of the dictionary term: to move into a machine to be processed.

4.1.7 Comment:

A reviewer suggested that a definition of "controlled area" needs to be included to specify whether the area is restricted for security reasons, radiological reasons, or both (Letter Number: 223).

Response:

A definition of "controlled area" has been added to the Glossary. The expression "controlled area" refers to controlled human access. Initially, the control excluded all persons not directly connected with the project and included control over the airspace above. The control was exercised both for security and for safety reasons. Although the entire Site is still controlled, the restriction of access has been loosened for some areas such as buffer zones east and north of the Columbia River and travel to the Washington Public Power Supply System (WPPSS) facility.

4.1.8 Comment:

One reviewer inquired about the meaning of the term "preconceptual," which is not in the dictionary (Letter Number: 110).

Response:

In an engineering project involving design of equipment or facilities, the term "conceptual design" usually refers to a design with a formalized concept. Before a concept is formalized, many ideas may be under consideration. This stage is usually referred to by the designers and engineers as the "preconceptual" stage.

4.1.9 Comment:

One reviewer noted, "In the identification and quantification of uncertainty, the draft EIS employs both empirical data and modeling information and generally fails to distinguish between the two. Further, the assumptions involved in both types of data are rarely quantified. This issue applies with specificity to groundwater modeling, climate projections especially rainfall, rate of dispersion through the soil, extent of protection offered by the barrier and so on. (For example, see Vol. 3, Section Q.1, Page 1.1 'average annual recharge of 5 cm/yr ...' and Vol. 3, Section Q.3, Page Q.3 water travel time of 925 years was chosen as most representative ..." (Letter Number: 217).

Response:

It is impractical to point out in each instance that a value is given whether it is an empirical result or the result from theoretical modeling based on empirical data. It was felt that readers would be able to determine between the two within the context of the material presented.

In the first example cited, the average annual recharge for the "wetter" climate was treated parametrically as a value ten times the expected value (0.5 cm/yr; some contend the value is zero) under present typical conditions of climate and vegetation at or in the immediate vicinity of the 200 Areas disposal sites. Thus, the recharge was chosen and the more complicated selection of combinations of precipitation and vegetation necessary to produce such recharge was avoided.

In the second example, where "water travel time of 925 years was chosen as most representative ...," the value was selected from among values calculated for various soils and thicknesses representative of those occurring at or near the 200 Areas waste sites. Thus, the value used in subsequent calculations was a theoretical value based on modeling that employed empirical data for its development and was "most representative" or typical of travel times to be expected at various disposal sites on the 200 Areas plateau.

4.1.10 Comment:

Concern was expressed that not all relevant references are cited in the text, that DOE has repeatedly and systematically misused references to scientific literature, and that conclusions are often reached via reference to other documents without providing a logic to the conclusion in the text. The contention was made that appendices are improperly used in some instances to provide analysis, where their proper function is to clarify and substantiate an analysis provided in the statement. It was also noted the text often expresses in relatively certain terms what is discussed with some degree of uncertainty in the appendices. A concern was expressed that the appendices do not correlate well with the main text to which they are supposed to relate. One reviewer requested comment on the statement found in a Hanford reference, the Savannah River Plant Final EIS on the Defense Waste Processing Facility, wherein it was stated that "Parts of this document are illegible." One reviewer felt that references were not readily available to the public. Another reviewer stated that the DOE was not able to provide copies of requested references within a month (Letter Numbers: 57, 170, 209, 215, 217, 223, 243-EPA. Hearing Number: 627).

Response:

Any omission of relevant references was an oversight and the final EIS has been screened for such omissions. Clarifications regarding references to scientific literature are being made, as well as additions where necessary to support conclusions within the text rather than just by reference, to improve correlation of appended material with the related text sections, and to ensure that there are no differences in terms of uncertainty between the text and appendix.

The illegible text probably arose from inadvertent reproduction from a poor copy. If the need still exists for a readable copy, the DOE at the Richland Operations office should be contacted.

As stated in the General Summary of the EIS, the principal references used are on file in the public reading room in the Federal Building in Richland, Washington.

Correlation of the appendices is shown in Figure 1 of Volume 2.

4.1.11 Comment:

Logic diagrams were called for to aid in identifying "next best variables or alternatives" in the event a given process was found unsatisfactory (Letter Numbers: 147, 217).

Response:

Because many of the processes are complicated and do not lend themselves to summary statements as usually found in logic diagrams, it was decided to continue the presentations using text descriptions. In the support document "Hanford Defense Waste Disposal Alternatives: Engineering Support Data for the Hanford Defense Waste Environmental Impact Statement," RHO-RE-ST-30 P (Rockwell 1985), flow diagrams are used to advantage.

4.1.12 Comment:

One reviewer noted that the final EIS should provide a much more detailed and quantitative description of the rationale used to determine whether wastes are "readily retrievable" (Letter Number: 215).

Response:

Wastes are "readily retrievable," for example, if they are "pumpable" from double-shell tanks or can be picked up, as in the case of post-1970 TRU waste stored in 55-gallon drums or encapsulated cesium or strontium stored in water basins.

The preferred alternative describes the class of wastes to be retrieved and disposed of. Before any disposal action is initiated, separate environmental compliance assessments will be made to ensure that the disposal action (including waste retrieval) is in compliance with applicable environmental regulations. Results of the assessments will be documented and reviewed.

4.1.13 Comment:

Two reviewers expressed the view that when the Interim Hanford Waste Management Plan (HWMP) and the Interim Hanford Defense Waste Management Technology Plan (HWMTP) are incorporated into the text, the final EIS should be more specific, explain the activity, and expand on its scope and relevance (Letter Numbers: 147, 217).

Response:

Efforts were made in the preparation of the final EIS to be more specific and to explain the relevance of the Interim Hanford Waste Management Plan (DOE 1986b), the Interim Hanford Waste Management Technology Plan (DOE 1986c), and other studies cited in the text. However, the HWMP/HWMTP will not be incorporated into the EIS. Once the Record of Decision is in place, these plans will be revised to reflect the decisions made.

4.1.14 Comment:

Reviewers stated that references to the health and safety of the public do not describe how this safety will be determined. The reviewers wondered whether it is merely assumed that if the material is stored appropriately, the safety of the public will be sufficiently ensured (Letter Numbers: 199, 223).

Response:

"Stored appropriately" means isolated in a way that prevents waste from entering the accessible environment in amounts injurious to health and safety and that renders intrusion into the wastes by man or other biota highly unlikely. In addition, for as long as institutional controls exist, monitoring and surveillance programs will be conducted to ensure that the disposal system operates as designed. This, the DOE believes, will sufficiently ensure public safety.

4.1.15 Comment:

Two reviewers addressed the selection of the values of number of people used in the calculations of impacts during the operating phases. One questioned the use of data from an older population projection. Another pointed out a typographical error in the populations presented (Letter Numbers: 215, 223).

Response:

Radiological impacts from routine operations are essentially all projected to result from atmospheric releases. In keeping with standard practice in the nuclear industry (regulated by the Nuclear Regulatory Commission), an area described by a radius of 80 km (50 miles) from the source was used. For these calculations, a reliable source of projected population data, PNL-4010 (Sommer, Rau and Robinson 1981), was used. In analyses of long-term releases, the potentially affected population is derived from the projected population along the river, from Hanford to the Pacific Ocean, because the more likely pathway is via groundwater to the Columbia River.

4.1.16 Comment:

A reviewer pointed out that the 618-2 burial ground is not inside the 300 Area, as stated in Appendices A and P of the draft EIS (Letter Number: 223).

Response:

The reviewer is correct that the 618-2 burial ground is not inside the 300 Area; however, it is very close by. The final EIS has been corrected. Further review of inventory data has revealed that the 618-2 burial ground area is actually a low-level site, and not TRU as originally stated. See Appendix A, Section A.5, for additional information.

4.1.17 Comment:

A reviewer questioned the use of the term "ditch" versus "trench." On p. V.1 of the draft EIS, "ditches" are defined as "unlined excavations used for conveying the low-level liquid waste to the pond." However, neither the 216-S-10 ditch nor the 216-B-63 ditch is used to convey low-level liquid to pond, but fulfills the purpose of a trench (i.e., specific retention) (Letter Number: 223).

Response:

In several cases, the designation of ditch has been given to sites used to dispose of liquids rather than to convey liquids. A revision has been made in the final EIS, Section V.1.

4.1.18 Comment:

Reviewers stated that imprecise words such as "most," "remainder," "bulk," "small quantities," "low-level," "probable," "likely," and "unlikely" should be defined; preferrably, actual figures should be stated (Letter Numbers: 125, 171, 174, 209).

Response:

Where appropriate, imprecise wording has been removed from the final EIS. Chapter 1, however, is a summary, and quantification is therefore not always appropriate.

4.1.19 Comment:

Reviewers noted that in several places, the draft EIS states that more environmental protection will be considered if needed. It is not clear what additional environmental protection is to be considered or what conditions would prompt this consideration (Letter Numbers: 171, 219).

Response:

Additional environmental protection refers to additional protection for the TRU-contaminated soil sites and the pre-1970 buried suspect TRU-contaminated solid wastes that have already been disposed of. Those wastes if generated today might be classified as TRU wastes, for which different disposal might be more appropriate. The additional protection considered was either provision of a protective barrier and marker system or retrieval and emplacement in a geologic repository. A condition that would prompt such action would be the discovery that there was a potential for significant environmental impact if the wastes were left disposed of in place.

4.1.20 Comment:

Several concerns were expressed in regard to modeling and uncertainties in the results of analyses. The aggregation of error as a result of multiple assumptions was cited, as was the need to determine that the predictive models adequately reflect the past and present. A call was made in general for discussion of uncertainties in modeling and with key parameters.

Response:

See comment 3.5.6.53.

4.1.21 Comment:

A reviewer noted that "Appendix R combines results from nearly all the preceding appendices. Nonconservatism pointed out in this review in those appendices is, therefore, compounded in Appendix R.

The reviewer commented that the results of the evaluation of maximum radiation doses appear more similar for the geologic, in-place stabilization and reference alternatives than is reasonable, given the current state of knowledge, and that the consequences of the in-place stabilization and reference alternatives differ from consequences of the geologic disposal alternative by a greater degree than is indicated in the draft EIS (Letter Number: 223).

Response:

Conservatism as used in the EIS means that, where choices of parameters were necessary, values chosen were those believed to be reasonable yet pessimistic enough that actual impacts would probably be less than those presented in the EIS. And where values of parameters were supported by data in the literature, the actual values were used. Conservative modeling approaches using these parameters therefore yielded conservative results.

The analysis presented in the EIS is believed to provide for an adequate comparison of the merits of disposal of Hanford defense waste by placement in deep geologic repositories, by in-place stabilization, by the reference alternative, or by the no disposal action, and to provide a basis for direction of waste disposal action. The possibility exists that different choices of parameters might provide for more striking differences among alternatives, because the results would tend to be consistent with analyses presented and therefore would not be of additional benefit in decision making. Review of the draft EIS by agencies and the public has led to the preferred alternative by which the DOE would begin disposal of certain waste classes where knowledge gives reasonable assurance of success and would conduct additional development and evaluation where such knowledge is insufficient.

4.1.22 Comment:

Reviewers commented on the quality and presentation of cost figures and analysis in the draft EIS, including oversights in cost tables (Table 3.6); inappropriate comparison to granite repository costs; inadequate, opportunistic, and selective cost arguments; evidence of higher Hanford costs and risks; unsubstantiated cost assumption (Letter Numbers: 30, 215, 217, 223).

Response:

The reference for Table 3.6 (now 3.7) cost figures (Rockwell 1987) was inadvertently omitted in the draft EIS. It is included in Section 3.4.1.7 of the final EIS. Cost figures for different repository media, such as salt or tuff instead of granite, would not change the relative position of geologic repository disposal in the cost analysis. Cost differences among the alternatives are significant and have been fairly represented by the DOE. Costs and health and safety performance considerations for a geologic repository will ultimately be determined under the repository program, and uncertainties in these costs are not believed to have significantly biased the EIS analysis. The draft EIS includes the assumption that decommissioning would require 20% of the capital cost of the transuranic waste recovery facility and equipment. This figure is based on past experience, which indicates a range of 10% to 20%. More recent cost figures, where available, have been used in the final EIS.

4.1.23 Comment:

A reviewer expressed the view that it was "irresponsible" of DOE not to present a "precise timeline for the operations outlined" (Letter Number: 216).

Response:

The purpose of the EIS is to present the defense waste disposal alternatives and a basis for comparing them. A precise timeline is not required to accomplish this purpose, nor can it be firmly established until disposal decisions have been made. Once a decision on disposal has been made, a timeline will be established for its implementation.

4.1.24 Comment:

A reviewer commented that Rockwell Hanford Operations has an extensive environmental monitoring program that, if discussed in this EIS, would eliminate many shortcomings in the document. Site-specific monitoring (for disposal alternatives) is extremely important. The program is in place and should be discussed (Letter Number: 223).

Response:

Site-monitoring experience is addressed in the draft EIS in Chapter 4 and Appendix V. Chapter 4 deals with climatology/meteorology monitoring. Appendix V addresses experience with monitoring to determine disposition and concentration of radioactive contaminants in the ground and groundwater. Additional information may be found in the references cited therein.

4.1.25 Comment:

Reviewers expressed concern over the lack of a "full-blown" or comprehensive study of the hydrology in the area just four miles from the Columbia River (Letter Numbers: 43, 219).

Response:

The reviewers did not specify what constitutes such a study; the hydrology of the Hanford Site has been extensively studied, however, as evidenced by the extensive references in Chapter 4 and Appendices O and Q of this EIS.

4.1.26 Comment:

One reviewer suggested including a description or definition of unplanned release sites, since one unplanned release site (216-E-15) is included as a TRU-contaminated soil site (Letter Number: 223).

Response:

A description of unplanned release sites is now included in Appendix A, Section A.4.

4.1.27 Comment:

One reviewer noted that radionuclide quantities in curies (Ci) as well as tons should be given in Table 1 (Letter Number: 243-EPA).

Response:

The material in the General Summary was intended for the non-scientific reader, for whom activity in curies might have little meaning.

4.2 SPECIFIC COMMENTS

4.2.1 Comment:

One reviewer felt that "The use of the term football field [on page 1.8 of the draft EIS] does not connote danger from radioactive wastes and could be misleading. Since the amount of strontium-90 at Hanford exceeds 100 million curies, and 1 curie of strontium-90 proportionately spread into drinking water could exceed the EPA drinking water standard for almost 1 year for the population of the United States, the comparison should help the public not only comprehend the volumes involved, but as well the dangers of radioactive wastes" (Letter Number: 233).

Response:

The analogy of the football field was used to give the reader a feeling for the volume involved. The hazard index of the waste (including that of strontium-90) was shown in Table 2, page 1.10.

4.2.2 Comment:

A reviewer commented that in the General Summary, p. 1.13, the discussion of the geologic disposal alternative is internally inconsistent. One sentence states that: "The geologic disposal alternative would dispose of most waste in deep geologic repositories and the remainder near surface at Hanford." (Emphasis added.) Three sentences later, it states that: "The bulk of the waste, containing small quantities of carbon-14, iodine-129, and other residual radionuclides, is low-level waste and would be made into a cement-based grout and disposed of near surface on the Hanford Site." (Emphasis added.) The reviewer felt that only one of these statements can be correct (Letter Number: 215).

Response:

This language was clarified in Chapter 1 of the final EIS.

4.2.3 Comment:

Pages 1.20, 1.21: "Health effects" should be defined in Tables 3 and 4. (Letter Numbers: 217, 243-EPA).

Response:

A footnote has been added to Tables 1.3 and 1.4.

4.2.4 Comment:

Page 3.8, Section 3.2.2: The impacts from extended production of special nuclear material beyond 1995 should be indicated in the appropriate places in Section 3.4.3 rather than simply noted here almost 60 pages from that section (Letter Number: 243-EPA).

Response:

Section 3.2 provides a discussion of wastes within the scope of the EIS; Section 3.2.2 of the EIS discusses future tank wastes and wastes associated with extended operation. Section 3.2.2 also lays the groundwork for determining impacts in terms of additional PUREX campaigns. Discussion of extended operations was considered a special case since the number of campaigns was not known. Details to develop impacts from such operations were provided in Section 3.4.3, so that the results could be used with other tables in Section 3.4. The method of using the data has been added to Section 3.4.3.

4.2.5 Comment:

One reviewer found Table 3.8 confusing. The table indicates concentrations of the nitrate ion in the Columbia River. Contamination levels are forecast at ranges from 6×10^{-7} to 9×10^{-4} mg/L; ambient levels are stated as currently in the range from 0.36 to 0.37 mg/L. It was not clear to the reviewer whether the chart represents additional loading or a decrease in ambient level (Letter Number: 223).

Response:

The cited nitrate concentrations were forecast as increments over ambient and have been clarified as such in the final EIS.

4.2.6 Comments:

Page 3.43, Section 3.4.2, second paragraph, lines 8 and 9. The DOE needs to recognize here, as is done in other places in the paragraph, the difference between active and passive institutional controls. To simply state that institutional control would make intrusion accidents unrealistic is not acceptable. Active controls may be considered viable but only for a limited time (100 years maximum). As stated earlier in the text, the EPA has never assumed that passive controls will ever prevent any type of intrusion but rather that they may significantly reduce the chance of systematic intrusion. In light of this, the statement needs to be clarified and an explanation given for why accidents would not be realistic (Letter Number: 243-EPA).

Response:

The statement in question should have said: "If the DOE were to select the no disposal action alternative and active institutional control were maintained, the intrusion accidents would not be realistic." The statement in question has been changed in the final EIS. The EPA rule states that active institutional controls may not be relied on for protection for more than 100 years after disposal, but it does not mean that active institutional control will cease after 100 years. It is because of the EPA rule that the DOE has analyzed the scenario assuming active institutional controls are absent after 100 years; however, in doing so, the DOE did not want to misleadingly imply that it would intentionally abandon the site after 100 years.

4.2.7 Comment:

Pages 3.59, 3.61, and 3.62, Tables 3.18-3.20: It is noted that in all three tables the "no disposal action" alternative violates 191.15 when averaged annually over 70 years. The same is true in Table 3.20 for the "in-place" and "reference" alternatives (Letter Number: 243-EPA).

Response:

Although the comment is correct, the fact that the no disposal action alternative exceeds 40 CFR 191.15 is relevant only as perspective for comparing disposal alternatives. The individual protection requirements of 40 CFR 191.15 are for undisturbed systems for the first 1000 years. Table 20 presents consequences for functional and disruptive barrier failures under an assumed wetter climate. Hence, these data do not apply to undisturbed systems.

4.2.8 Comment:

One reviewer had the following comments. Page 4.14, Figure 4.7: The figure illustrating surface water bodies on the Hanford Site is out of date. The Z-19 ditch no longer exists; the 216 S-10 ditch no longer exists; the upper half of the U-14 ditch has been replaced by a powerhouse pond. In addition, the labeling of B Pond in the figure (B-3A, B-3B, and B-3C) implies that there are only three sections to that pond. However, 3-A, B, and C are expansion lobes to the main pond, so in effect, there are four pond sections at this time. A possible addition would be the contingency pond, which is planned for the future. There should also be an explanation as to the numbering methodology of those sites, e.g., that the 216 stands for "200 Area low-level liquid waste site," etc. The numbering of the sites is not consistent. Most are listed as 216, followed by the letter and the number. The U-14 and Z-19 ditches are not listed that way. The reviewer suggested that consistency is needed (Letter Number: 223).

Response:

Revisions are shown in EIS Section 4.4.1 and Figure 4.7. A discussion of the nomenclature of the 200 Areas waste water ponds and ditches would provide no useful addition to Section 4.4.1.

4.2.9 Comment:

Page 4.30: Last bullet, the 600 Area description. An additional land use in the 600 Area is retired dry waste disposal sites, and several low-level liquid waste disposal sites, such as the Gable Mountain Pond and the BC controlled area, both of which are technically in the 600 Areas (Letter Number: 223).

Response:

The list provided was meant to be illustrative rather than exhaustive. The lead-in statement has been modified for clarity.

4.2.10 Comment:

Reviewers noted some inconsistencies in Figures 4.8 and 4.9, where basalt outcroppings did not match, and in Figure 4.5, which did not show some known Hanford area faults (Letter Numbers: 44, 223).

Response:

The figures have been revised in response to the comments.

4.2.11 Comment:

A reviewer noted that on Page 5.4, the draft EIS states that low levels of radionuclides observed in most foodstuff samples are attributable to worldwide fallout; a later sentence in the EIS states that cobalt, strontium and cesium were detected in some of these samples but with concentrations low enough that any radiation dose resulting from them would be negligible and is well below applicable radiation protection standards. The reviewer felt that the second statement seemed to imply that the activity detected in those samples is not from fallout, so it appears that it was in contradiction to the first sentence of the paragraph (Letter Number: 223).

Response:

The paragraph in question has been clarified to emphasize that cobalt-60, strontium-90 and cesium-137, probably from Hanford operations, were detected in samples of deer, rabbits, and other animals collected near operating facilities.

4.2.12 Comment:

Page 5.58: Loss of institutional controls due to abandonment of the site would not necessarily occur in association with depopulation of the region. War, insurrection, governmental collapse, or anarchy may not necessarily reduce surrounding populations (Letter Number: 243-EPA).

Response:

The clause in question read: "Following the time that the Site was assumed to be vacated ...." Because the issue is loss of institutional control (either active or passive) rather than vacation of the Site, the clause has been changed to read: "Following the time when active institutional control of the site is assumed to be absent...."

4.2.13 Comment

One reviewer commented that the reference at page 6.3 to the issuance of NPDES permits by the Washington State Department of Ecology should also include reference to the issuance of NPDES permits for thermal power plants by the Washington State Energy Facility Site Evaluation Council (Letter Number: 223).

Response

The reference at Page 6.3 was to issuance of NPDES permits to non-federal facilities and has been removed.

4.2.14 Comment:

Page 6.11: A reviewer commented that all cited references should be included in the reference list (Letter Number: 223).

Response:

Care has been taken to see that all cited references are included in the reference lists in the final EIS.

4.2.15 Comment:

Page B.16: The reference cited (DOE 1984b) does not directly address requirements for concentration of radionuclides in discharged air. A more appropriate reference would be DOE Order 5480.1A Chapter XI (Letter Number: 223).

Response:

DOE Order 5480.1A is discussed in Chapter 6 of Volume 1. The suggested change was made by citing EPA standard 40 CFR 61.

4.2.16 Comment:

Page B.31: Some values apparently were inaccurately converted from Table 2-14a of the reference document (Rockwell 1985) to Table B.2 of the draft EIS, especially in the existing tank waste glass column. Consequently, the average composition (Ci/m^3) of the final waste forms for the geologic disposal alternative appears to be underestimated by as much as a factor of 2 (e.g., cesium-137 and techetium-99). In addition, although it is stated that the values reported in the draft EIS for ruthenium-106 do not include activity of short-lived daughters in equilibrium with the parent radionuclide, it is not clearly explained why it is thought that the short-lived activity can be safely deleted from the values given in the reference document or how this was done (Letter Number: 223).

Response:

Values were calculated from the reference's Table 2-14b and Table 2-12, corrected for decay from 1990 (reference's Table 2-10) to 1995 (EIS page B.1). The tables from the reference document do not contain daughters (see Rockwell 1985, 2-10). The daughter radionuclides have not been ignored in the impact assessments. They are accounted for as a routine part of the models that were used.

4.2.17 Comment

A reviewer noted that in Section C.7 of the DEIS, dose commitments are cited as being within DOE limits. The reviewer suggested that all other dose limitations that the dose commitments fall into, such as EPA and NRC, also be listed (Letter Number: 223).

Response

Section C.7 has been revised in response to the comment to clarify that the EPA limit of 0.025 rem/yr to any member of the public will not be exceeded. The EPA is the governing authority for offsite radiation dose; NRC limits are not applicable.

4.2.18 Comment:

Page E.6 says that certain remote-handled (RH) TRU waste will be stored with waste from the decontamination and decommissioning of facilities. Reviewers wanted the final EIS to clarify that RH-TRU is sent to WIPP if that alternative is selected (Letter Numbers: 147, 217).

Response:

With the exception of the in-place stabilization and disposal alternative and the no disposal action alternative, all retrievably stored and newly generated TRU having a concentration of at least 100 nCi TRU/g will be sent to WIPP. This includes RH-TRU.

4.2.19 Comment:

A reviewer suggested that on Figure F.1, a pathway should be identified originating from waste disposal activities (Letter Number: 223).

Response:

Figure F.1 is a generic figure. The "Nuclear Facility" in the figure applies to any handling operations involving waste.

4.2.20 Comment:

Page F.12: The connection between particle velocities used in the draft EIS and the reference document (AEC 1968) is not clear (Letter Number: 223).

Response:

The deposition velocities used in the draft EIS were derived from Chapter 5.3 of the cited document, "Deposition of Particles and Gases," pp. 202-208.

4.2.21 Comment:

Page F.16: The wrong reference (Strenge 1975) is cited for documentation of SUBDOSA. Strenge, Watson and Houston (1975) should be cited (Letter Number: 223).

Response:

The reference citations have been corrected.

4.2.22 Comment:

Page F.17 Reference 14.15: BIOPORT/MAXII was not mentioned among the numerous codes reviewed in the reference document (McKenzie et al. 1982). The citation in the draft EIS associates BIOPORT/MAXII with the reference document (Letter Number: 223).

Response:

McKenzie et al. 1982 (Vol. 2) contains a listing of the BIOPORT code. Volume 5 in the series is the users' manual.

4.2.23 Comment:

Page F.19: The draft EIS states that estimated downriver populations are taken from the projections of the reference document (Yandon and Lindstrom 1980). But the reference document only provides population estimates out to a 50-mile radius from Hanford, not downriver (Letter Number: 223).

Response:

The final EIS text has been revised in Section F.3.2.1. Since no growth projection was available for the downstream population, it was assumed that the downstream population would increase at the same rate as the 80 km population projection of Yandon and Lindstrom (1980), i.e., growth of a factor of 10 to about 5,000,000.

4.2.24 Comment:

Page F.30: Reference to measurements of radioactive fallout was not found in the reference document (IAEA 1984) (Letter Number: 223).

Response:

IAEA (1984) states, at p. 41: "Often parts of the model can be validated by comparison of calculations with field observations.... Radionuclides from fallout can provide observations over some decades for validation of models or submodels."

4.2.25 Comment:

Page F.30: The draft EIS states that the mathematical models used in the reference document to simulate the behavior and fate of radionuclides in environmental media are based on formulas originally used in the HERMES computer code. This was not confirmed, as no mention of HERMES was found in the reference document (Letter Number: 223).

Response:

HERMES is referenced in Reg. Guide 1.109 as both A03 and E-10. A good history of the development of terrestrial models is given by F. O. Hoffman et al. 1977.

4.2.26 Comment:

Page F.31: The reference (NRC 1981) was not confirmed because only Volume 2 of the four-volume reference document was provided for review and the citation was apparently not from Volume 2 (Letter Number: 223).

Response:

The material in question can be found both in Volume 1 of the reference document (p. 41) and in Volume 2 (pp. 7-11).

4.2.27 Comment:

Page F.34: Use of the PABLM code was not confirmed. The copy of the reference document (ONWI 1983) provided for review was incomplete, and it appears this may not be the right reference (Letter Number: 223).

Response:

Reference check confirms the citation.

4.2.28 Comment:

Page F.35 Reference 17.1: The draft EIS implies that the PABLM code was used to calculate projected radiation doses reported in the reference document (NAS/NRC 1983). No mention of PABLM was found in the reference document (Letter Number: 223).

Response:

NAS/NRC (1983) references PABLM in Chapter 9 (p. 248 et seq. p. 297) and in Appendices B and C.

4.2.29 Comment:

Pages F.36, F.38: Reference document provided for review was EPA-520/5-80-002 (draft), not EPA-520/5-80-026 as cited. There is no entry for "EPA 1982" in the reference list (Letter Numbers: 223, 243-EPA).

Response:

The reference for 40 CFR 191 has been corrected to read "EPA 1985b."

4.2.30 Comment:

Page H.10: A DOE guideline of 0.5 rem/yr to a member of the population from occasional releases at federal facilities was not found in the reference document (DOE 1986a). The same statement in the draft EIS refers to a 1985 DOE memorandum by W. A. Vaughan, which is not listed separately as a reference and is not included in the set of references provided by DOE (Letter Number: 223).

Response:

The reference has been revised to DOE Order 5480.1B.

4.2.31 Comment:

Page H.10: No mention of ferrocyanide precipitates was found in the reference cited (Quinn et al. 1980). Ferrocyanide precipitates were briefly mentioned on page 5.5 of Mishima et al. (1986), but no reference was cited there (Letter Number: 223).

Response:

Fully documented discussions of the ferrocyanide precipitates are not available. A recent PNL report (Martin 1985) suggests that the explosion is really very unlikely.

4.2.32 Comment:

One reviewer questioned whether the last sentence on p. I.17 of the draft EIS referred only to spent fuel shipments or to all shipments requiring Type B packaging (Letter Number: 223).

Response:

Additional explanation has been added to the text of the final EIS in Section I.4.1.

4.2.33 Comment:

Pages J.2 and J.3: A more detailed description of the RECON model is needed. From the information given it is not possible to review the assumptions or the methodology used to generate the cost numbers presented for the alternative disposal methods under the various environmental conditions. Furthermore, there is no cost-effectiveness analysis for the various alternatives; this would be an important input to the final decision-making process (Letter Number: 243-EPA).

Response:

In the final EIS the RECON model was used only for the TRU wastes. The method employed is discussed in detail in the cited reference (Clark et al. 1983). The presentation has been further supported by an additional reference. A cost-effectiveness analysis was per se not performed, because of the preliminary nature of some of the information, complexity of the waste class/alternatives matrix (24 elements) and lack of an appropriate measure of effectiveness (expected impacts, accidents, regulatory compliance, etc.).

4.2.34 Comment:

One reviewer noted that the reference source for the gravel moisture-characteristic curve shown on Figure M.4 is incorrectly cited (Letter Number: 223).

Response:

The citation has been corrected in the revised Appendix M.

4.2.35 Comment:

Pages N.2, N.3: No page number is given for the quote from BEIR III (1980), and the quoted sentences could not be located in the reference (Letter Number: 223).

Response:

The indicated quotation appears on p. 142-3 of BEIR III (NAS/NRC 1980, p. 190 of the transcript version). The final EIS was revised to clarify the location of the quotation.

4.2.36 Comment:

Page N.6: Apparently no table in the reference document (BEIR III, NAS/NRC) gives the numbers in Table N.2 directly. The central and lower-bound values have to be calculated from the upper-bound values in Table 2-2 using formulas given on pages following page II-97 (Letter Number: 223).

Response:

The reviewer is correct.

4.2.37 Comment:

Page N.8: The text on page N.8 is somewhat misleading. To get the 1% figure for the autosomal dominant and X-linked disorders, color blindness must be included. While the other disorders listed are certainly an "appreciable handicap," many would disagree with this characterization of color blindness. This description of this type of disorder implies that

1 baby in 100 has a handicap such as six fingers, anemia, or muscular dystrophy. The discussion of the irregularly inherited disorders is also misleading. It implies that 9 babies out of 100 are seriously handicapped by these disorders. The phrase "at some time during their lifetime" in BEIR III (NAS/NRC 1980) has been omitted. Thus, the inherited disorder may be the tendency to develop heart disease or a certain type of cancer late in life (Letter Number: 223).

Response:

The discussion presented in the EIS is considered an accurate representation without adding inconsequential detail that would not change the conclusions for purposes of comparing the waste disposal alternatives.

4.2.38 Comment:

Page 0.2: The draft EIS (pp. 0.2 through 0.5) contains several pages of quotations from the cited reference (DOE 1984a). Ellipses (...) are used at several points in the quoted material to indicate where parts of the cited document are omitted. However, numerous other omissions are unmarked. The significance of these omissions to the draft EIS conclusions has not been determined (Letter Number: 223).

Response:

The majority of omitted material describes the deep basalt formations and fluvial sequences that have no bearing on the pathway of releases from the near surface at the Hanford Site. Some omitted material also deals with the Ringold formation, Pliocene-Pleistocene unit, and Hanford formation immediately above the BWIP reference repository location. It was decided to omit the material that is specific to the BWIP subregion because it does not apply to the entire Hanford Site. These omissions do not affect the draft EIS conclusions.

4.2.39 Comment:

Page 0.2: The authors cited (Swanson et al. 1979) considered the Ringold Formation to be Pleistocene. The draft EIS citation indicates a Pliocene age (Letter Number: 223).

Response:

The quote on Page 0.2 was from Swanson et al. (1979), who cited Merriam and Buwalda as early investigators for information on the Ringold formation. More recent studies define the age of the Ringold Formation as Miocene-Pliocene (Swanson et al. 1979; Myers et al. 1979; Tallman et al. 1981). However, the age of the Ringold formation has no impact on the conclusion of the EIS. The references noted above can be found in the Appendix 0 reference list.

4.2.40 Comment:

Page 0.4: A reviewer pointed out that the sediments of the Ringold formation approach a thickness of 365 feet, not meters (Letter Number: 215).

Response:

The EIS has been corrected.

4.2.41 Comment:

Page 0.10: The draft EIS states that the vadose zone is "relatively thick." This statement is too qualitative (Letter Number: 215).

Response:

For quantitative information on the vadose zone, refer to Appendix Q.

4.2.42 Comment:

Page 0.12: The report cited (Isaacson and Brown 1978) appears to contain a factual error that contradicts the draft EIS citation: "A previously conducted study, using lysimeters near the 200 East Area, concluded that unsaturated sediments retain little or no additional water under existing arid climate conditions (emphasis added). The reference gives an undocumented summary of lysimeter experiments conducted in 1973 through 1974 south of the 200 East Area. Figure 14 (p. 26) from the reference purports to show soil moisture content in the Hanford open-bottom lysimeter, and is interpreted to indicate that no additional moisture was retained in the soil at the end of the study period. In fact, the final moisture curve (Oct. 18, 1974) does not show moisture in the open-bottom lysimeter, which, as described in the cited reference by Last, Easley and Brown 1976, p. 9-10 in Appendices, did retain additional moisture, not only at the 1974 measure, but also through water-year 1975 through 1976. This moisture resulted from heavy rains in 1973 and 1974.

Page 0.12: The draft EIS accurately cites the conditions of this reference. However, one of the two lysimeter monitoring results (the open-bottom lysimeter) reported in this reference did in fact still retain significant additional moisture in the soil profile, approximately 2 years after the causative rainfall. Thus, the validity of the conclusion is questionable and the results of the cited studies do not necessarily differ as asserted in the draft EIS. (See Gee and Heller 1985, p. 11: "deep drainage at the lysimeter site is likely occurring.") (Letter Number: 223).

Response:

The reviewer is referred to Fayer, Gee and Jones (1986) who support the assumption of little or no drainage at the 200 Area lysimeters due to plant water uptake, as indicated by the modeling. The following statement is taken from p. 7.29 of their report: "Note that even though they covered only 6% of the lysimeter surface, the simulated plants were able to remove 2.3 cm of water from the lysimeter. This transpired water represented 17% of the precipitation for the year. Evaporation removed 16 cm of water, so that the total annual water loss was 18.3 cm. In other words, storage in the lysimeter decreased by 4.9 cm during the year, a condition that would not support long-term deep drainage or recharge."

4.2.43 Comment

Pages 0.16-0.17: Are all equations from Richards (1931)? (Letter Number: 243-EPA).

Response:

Equation O.1, Section O.4.1.1, is a reduced form of the Richards' Equation as described by Gardner (1958). Except where referenced, the remaining equations in this section are related to soil data fitting as described by Campbell (1974).

4.2.44 Comment:

Page O.27: The reference for DOE (1986c) was cited but not listed or supplied with the supporting documents. Mention of the modeling elements cited in the draft EIS cannot be found in this reference (Letter Number: 223).

Response:

The wrong document was referenced. Instead of the Hanford Waste Management Plan, the reference should have been to the Interim Hanford Waste Management Technology Plan. The latter mentions the modeling elements on pages IV-5 through IV-12. The final EIS has been corrected.

4.2.45 Comment:

Page Q.2: The reference (Fecht, Last and Marratt 1979) gives no information on the drilling and sampling methods used in obtaining samples of subsurface sediments, nor does it describe how the textured analysis was performed. Because these factors can have a very substantial influence on the interpreted grain-size distributions, the validity of the data matches described in the draft EIS cannot be assessed (Letter Number: 223).

Response:

The monitoring wells are drilled by the core barrel method through fine-grained materials above the water table. A cable tool percussion bit is used to break up the rocks only where cobbles or exceedingly hard formations are encountered. Samples are taken every 1.5 meters (5 feet) from ground surface and at each change in sediment type.

Granulometric data reported in Fecht, Last and Marratt (1979) were obtained by shaking 150 grams of soil from each sample through a nest of nine sieves, and the disaggregate retained by each screen was weighed and recorded. A Rotap or similar mechanical shaker was used with a shaking time of 15 to 25 minutes. Sieve openings ranged from 0.037 to 4 millimeters. Samples from the side wall of the AP tank farm excavation were hand dug, and similar granulometric data were taken.

4.2.46 Comment:

A reviewer pointed out that page Q.33 of the draft EIS indicates that the tank bottom elevation in the BY and B tank farms are not the same as was indicated in Table Q.17. Also, the minimum tank bottom elevation in the A Farm is 193 m, not 194 m (Letter Number: 223).

Response:

The table in Appendix Q has been updated to show correct elevations.

4.2.47 Comment:

A reviewer made the point that the cross-hatched area in Figures S.11 through S.13 should be identified as the area where the standards are exceeded (Letter Number: 243-EPA).

Response:

Appendix S has been revised in response to this comment.

4.2.48 Comment:

Page S.17: The connection between annual borehole frequency/km^2 in the draft EIS and the reference document (Little 1980) is unclear (Letter Number: 223).

Response:

The first (Little 1980) reference on p. S.17 has been deleted. The second (Little 1980) reference gives the range of drilling frequencies.

4.2.49 Comment:

Appendix T: This appendix provides insufficient information to check emission calculations. It is especially important that TSP emissions be accurately depicted. It is noted that there are apparently some significant sources of SO_2. The sources of SO_2 should be described.

There is insufficient information to determine whether source characterizations in the air quality model are appropriate. Horizontal dimensions of volume sources are not given. A map of the sources should be provided (Letter Number: 243-EPA).

Response:

All source information, including emission rates, that is presented in Appendix T was obtained from a working draft of Rockwell (1985).

It is stated in Appendix T that "a volume source was specified encompassing the 200 East Area." There are several figures showing the Hanford Site and the 200 East Area in Volume 1 of the EIS.

4.2.50 Comment:

One reviewer pointed out the need for a note on Figure V.2 to state that the drawings are not to scale (Letter Number: 223).

Response:

The middle drawing is not to scale, the other two are. "Not to scale" has been added to the figure.

4.2.51 Comment:

Page V.3: Contrary to the citation, no calibration involving radiocontaminant behavior is included in the references (Kipp et al. 1972; Reisenauer 1979) (Letter Number: 223).

Response:

The text of Appendix V has been corrected.

4.2.52 Comment:

Section V.6, Disposal Ponds: The 216-U-10 pond and associated ditches are discussed, but nowhere is it discussed that the pond and major ditches flowing into that pond have been retired and stabilized. In addition, the heading should be changed from "Disposal Ponds" to the "216-U-10 Pond Systems," since that is the only pond that is discussed (Letter Number: 223).

Response:

The text of the EIS has been revised; however, the heading was retained for consistency with other section headings in Appendix V.

4.2.53 Comment:

A reviewer commented that data was available showing significant lateral migration of contamination from the 216-A-24 crib. The reviewer thought that this information should be added to the characterization of the crib, because it showed that there can be significant lateral migration of contamination from a disposal site that cannot necessarily be identified by looking at the surface boundaries of the site (Letter Number: 223).

Response:

The subject text was meant to reveal that the extent of horizontal migration of nuclides was not known. Surface area of a site would not be expected to be evidence of expected lateral migration. Additional characterization efforts have resulted from the discovery of the migration of uranium oxide (UO) from the crib. Monitoring programs are being expanded to better understand migration in general of nuclides from waste sites.

4.2.54 Comment:

A reviewer noted that a reference cited in the draft EIS (Craig and Hanson 1985) analyzes hydraulic aspects of glacial flooding, not the probability of occurrence as cited in Appendix R of the draft EIS (Letter Number: 223).

Response:

The wrong reference was cited; the analysis was reported by Craig in 1983 in an unpublished document, "Analysis of Ice-Age Flooding from Lake Missoula," Kent State University, Kent, Ohio.

4.2.55 Comment:

A number of editorial comments were received. The final EIS text has been revised as necessary in response to those comments (Letter Numbers: 147, 215, 217, 223, 231, 234, 243-EPA).

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APPENDIX A

INDEX FOR PUBLIC COMMENT LETTERS

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APPENDIX A

ALPHABETICAL LIST FOR PUBLIC COMMENT LETTERS

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Acord, James	507 Third Avenue Unit 914 Seattle, WA 98104-2355	79	3.3.4.2, 3.3.5.2
Adair, Frederick S. Research Analyst House Energy & Utilities Committee	Washington State Legislature Olympia, WA 98504	149	3.1.3.26, 3.3.1.5, 3.3.3.1
Adams, Brock	See U.S. Senate		
Adams, Gregory	(No Address) Tri-Cities	126	2.2.4, 3.3.5.3, 3.3.5.4
Affiliated Tribes of Northwest Indians Faith Mayhew ATNI Executive Director	1425 N.E. Irving, Suite 102 Portland, OR 97232	163	2.2.1, 2.3.1.3, 2.3.2.8, 2.4.1.4, 3.3.1.1, 3.3.2.1, 3.3.5.7
Alsworth, A. M.	See Oregon Department of Energy		
Alvarez, Robert	See Environmental Policy Institute		
American Water Works Association John E. Dennee, President	Mid Columbia - Deschutes Subsection 6780 Reservoir Road The Dalles, OR 97058	16	2.1.1, 2.5.5, 3.5.3.11, 3.5.4.3
Anderson, Mary Voegtlin	6844 30th Avenue N.E. Seattle, WA 98115	90	2.1.1, 2.1.9, 2.3.1.14, 2.5.6, 3.3.1.1, 3.3.4.2
Anderson, Mr. and Mrs. Rodger J.	3644 N.E. 46th Ave. Portland, OR 97213	132	3.3.5.2
Arnis, Nick	P.O. Box 604 Portland, OR 97207	197	2.1.8, 2.2.9, 2.2.10, 2.3.2.8, 2.5.6
Atiyeh, Victor	See Office of the Governor		

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AuCoin, Les	See U.S. House of Representatives		
Audubon Society of Portland Diana Bradshaw	5151 N.W. Cornell Road Portland, OR 97210	187	2.4.1.8, 2.5.5, 2.5.6, 3.1.6.1, 3.2.4.1, 3.2.4.2, 3.2.4.3, 3.2.4.5, 3.3.1.1, 3.3.1.5, 3.3.5.1, 3.3.5.2, 3.3.5.9, 3.4.2.2, 3.5.5.1, 4.1.1
Audubon Society of Salem Robbie Earon Conservation Chair	P.O. Box 17873 Salem, OR 97305	207	2.1.1, 2.2.1, 2.5.6, 3.3.1.1
Baker, Lynn W.	3938 N. Overlook Blvd. Portland, OR 97227	167	2.5.6, 3.1.8.9
Barfield, Terri L.	817 14th Way Edmonds, WA 98020	220	2.1.1, 2.1.10, 2.2.14, 2.5.6
Barnett, Clarence	See Northwest Citizen's Forum on Defense Waste		
Bartels, John	P.O. Box 10744 Portland, OR 97210	23	2.3.2.8, 2.5.5
Bauer, Al	See Washington State		
Bayley, F. S.	900 University St. 6A Seattle, WA 98101-2728	179	2.1.1, 2.5.6
Behring, Pamela C.	1418 E. 13th Spokane, WA 99202	199	2.3.1.14, 2.3.2.8, 2.3.2.9, 3.5.5.42, 4.1.14
Belsey, Richard, M.D.	See Portland Chapter of Physicians for Social Responsibility		
Bennett, Gerry	14416 S.E. 37th Bellevue, WA 98006	105	3.3.4.2
Bereano, Philip L. Associate Professor	E.I.C.P. FH-40 University of Washington Seattle, WA 98195	208	2.1.8, 2.2.3, 2.2.7, 2.3.1.14, 2.3.2.3, 2.5.5, 2.5.6, 3.1.6.1, 3.2.4.1, 3.3.2.1, 3.3.4.1, 3.3.4.2, 3.5.2.54
Berleman, Janet J.	See Religious Society of Friends (Quakers)		
Bickett, Gary	15105 Twin Fir Rd. Lake Oswego, OR 97034	204	2.3.2.8, 2.5.5, 2.5.6, 3.3.1.1, 3.3.4.2
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Bogle, Dick	See Portland, City of		
Bonker, Don	See Washington State		
Bosch, Gerald H.	648 S. Booker Rd. Othello, WA 99344	221	2.3.2.12
Boscole, Jeff	3425 W. Lake Sammamish Road S. Bellevue, WA 98008	11	2.5.5, 3.5.6.35, 4.1.27
Box, Jalair L.	1231 N.E. 92nd St. Seattle, WA 98115	182	2.4.1.8, 3.1.3.17, 3.3.4.2
Boyle, Julie Ann	Fruitland, WA 99129	170	2.2.1, 2.3.2.3, 2.5.6, 3.1.3.21, 3.1.6.1, 3.1.8.1, 3.1.8.9, 3.1.8.10, 3.1.8.11, 3.1.8.14, 3.3.1.9, 3.3.3.1, 3.3.5.4, 3.4.1.3, 4.1.6, 4.1.10
Bradford, Ann	Coeur d'Alene, ID	191	2.5.6, 3.3.5.1, 3.4.2.2
Bradshaw, Diana	See Audobon Society of Portland		
Bremer, D. Kamala	2222 S.E. Salmon Portland, OR 97214	19	2.1.1, 3.3.5.4
Brill, Gary	8504 19th Ave. N.W. Seattle, WA 98117	83	2.2.1, 2.2.3, 2.5.5, 3.3.5.4
Bringloe, Anne	See Sierra Club		
Broadwell, J.	See Students for Nuclear Awareness		
Brown, Roger C.	Rt. #1, Box 1629 Benton City, WA 99320	180	2.2.3, 3.3.1.1, 3.4.1.1
Browning, Robert E.	See United States Nuclear Regulatory Commission		
Burchell, Kenneth W.	Spokane, WA	108	2.1.1, 2.2.1, 2.5.6
Burke, William H.	See Confederated Tribes of the Umatilla Indian Reservation		
Burroughs, David	See Save the Resources Committee		

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Buske, Norm	See Search Technical Services		
Buzzard, Beth	2016 E. State Ave. Olympia, WA 98506	92	2.1.1., 2.2.1, 3.3.5.2, 3.4.2.2
Carpenter, Patricia M. and family	Rt. #1, Box 1799 Hermiston, OR 97838	181	2.1.1, 2.5.6, 3.2.6.1, 3.4.2.2
Cashdan, Rochelle	3649 S.E. Yamhill Portland, OR 97214	48	2.1.1
Chesbrough, C. Ray	See Conservation Plus Windows Inc.		
Christofferson, John R.	817 14th Way Edmonds, WA 98020	226	2.1.1, 2.1.8, 2.2.14, 2.5.6
Christofferson, Marilyn	817 14th Way Edmonds, WA 98020	225	2.1.1, 2.1.8, 2.2.14, 2.5.6
Clark, Barbara	P.O. Box 1222 Walla Walla, WA 99362	127	2.3.2.5, 2.5.5, 2.5.6, 3.3.4.2
Clark County, Public Utility District Jane A. Van Dyke Commissioner	1200 Fort Vancouver Way P.O. Box C-005 Vancouver, WA 98668	26	2.1.1, 3.2.4.1
Clark, Michael L.	1008 Prospect Ave. N.E. Olympia, WA 98506	148	3.1.8.9, 3.3.1.1
Coffin, Ruth	See League of Women Voters		
Columbia River Inter-Tribal Fish Commission S. Timothy Wapato Executive Director	975 S.E. Sandy Blvd., Suite 202 Portland, OR 97214	178	2.2.13, 2.3.1.14, 2.4.1.23, 2.4.2.2, 3.1.1.1, 3.1.4.9, 3.1.4.33, 3.2.4.2, 3.2.6.1, 3.2.6.4, 3.3.5.2, 3.5.5.1, 3.5.5.32, 3.5.6.6, 4.1.1

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Confederated Tribes of the Umatilla Indian Reservation William H. Burke, Director Umatilla Nuclear Waste Study Program	P.O. Box 638 Pendleton, OR 97801	231	2.3.1.14, 2.4.1.1, 2.4.1.9, 2.4.1.10, 2.4.2.2, 2.4.2.3, 3.1.3.12, 3.1.6.1, 3.1.8.1, 3.2.4.2, 3.2.5.1, 3.2.6.4, 3.2.6.5, 3.2.6.6, 3.3.1.3, 3.3.3.1, 3.3.4.1, 3.3.5.9, 3.4.1.2, 3.4.1.4, 3.4.2.1, 3.4.2.11, 3.4.3.1, 3.4.3.6, 3.4.3.8, 3.5.1.7, 3.5.1.9, 3.5.1.25, 3.5.1.27, 3.5.2.4, 3.5.2.6, 3.5.2.8, 3.5.2.11, 3.5.2.12, 3.5.2.27, 3.5.3.1, 3.5.4.6, 3.5.5.8, 3.5.5.42, 3.5.6.5, 3.5.6.7, 3.5.6.32, 3.5.6.35, 3.5.6.41, 4.1.1, 4.2.55
Conner, Tim	See Hanford Education Action League		
Conscience and Military Tax Campaign Richard H. Wood	1830 24th Ave. E. Seattle, WA 98112	84	2.1.3, 2.3.2.8, 2.5.5, 2.5.6
Conservation Plus Windows, Inc. C. Ray Chesbrough	Cascade Business Park 1085 12th Ave. Bldg. D6B Issaquah, WA 98027	33	2.1.1, 2.3.2.8, 3.3.5.2
Coskey, Theodore C.	749 N. 79th Seattle, WA 98103	32	2.1.1, 3.4.3.1
Cottingham, David	See United States Department of Commerce		
Cotton, Karen	Silver Beach Coeur d'Alene, ID 83814	227	2.5.6, 3.3.5.1, 3.4.2.2
Couch, Marilyn	1705 N.W. 32nd Portland, OR 97210	201	2.2.10, 2.2.11, 2.3.2.9, 2.5.5, 3.1.1.10, 3.1.6.1, 3.2.6.1, 3.3.1.1, 3.3.2.5, 3.3.3.1, 3.5.1.7, 3.5.1.57, 3.5.3.6, 3.5.3.9, 3.5.3.11, 3.5.4.4
Coughlin, Bernard J.	See Northwest Citizens Forum		
Crandall, Christy A.	2134 N.E. 51st St. Portland, OR 97213	200	2.1.1, 2.2.1, 2.2.11, 2.3.2.8, 3.2.4.1
Currie, Ruth	10630 S.W. Lancaster Rd. Portland, OR 97219	62	2.1.1, 2.5.5, 2.5.6, 3.4.2.2
Davis, David G.	See United States Environmental Protection Agency		
de Grasse, Gretchen	127 Whitman St. Walla Walla, WA 99362	117	2.1.1, 2.5.5, 2.5.6

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Denniston, Charlotte	See Greenpeace		
Diehl, Dorothy	P.O. Box 441 Mt. Angel, OR 97362	91	3.3.4.2, 3.3.5.2
Dixon, Frank	See Northwest District Association		
Earon, Robbie	See Audobon Society of Salem		
Edinger, Heidi M.	S. 2335 Silver Beach Coeur d'Alene, ID 83814	229	2.5.6, 3.3.5.1, 3.4.2.2
Ellis, Frederick E.	P.O. Box 462 Shaw Island, WA 98286	136	2.2.1, 2.5.5, 2.5.6
Environmental Policy Institute Robert Alvarez, Director Nuclear Project	218 D. Street, S.E. Washington, DC 20003	242	2.2.10, 2.2.12, 2.2.16, 2.3.1.14, 2.3.2.8, 2.4.1.8, 2.5.5, 3.1.1.1, 3.1.4.5, 3.1.4.9, 3.1.4.32, 3.1.8.1, 3.1.8.9, 3.3.2.2, 3.4.3.4, 3.5.1.30, 3.5.5.11
Erb, George	16705 Maplewild Ave. S.W. Seattle, WA 98166	106	2.5.5, 3.3.1.1, 3.3.2.1, 3.3.5.4,
Evans, Dale R.	See United States Department of Commerce		
Evans, John V.	See Office of the Governor		
Ferber, Mr. and Mrs. Robert H.	9052 39th Ave. S.W. Seattle, WA 98136	96	2.1.1
Ford, Peter	704 S.E. 15th Portland, OR 97214	205	2.1.1, 2.2.1, 3.2.4.1
Frank, Lynn D.	See Oregon Department of Energy		
Frothingham, Peter	3131 N.E. Emerson Portland, OR 97211	30	2.1.1, 2.5.5, 3.4.2.2, 4.1.22

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Gardner, Andrew	See Pandah, Inc.		
Gardner, Booth	See Office of the Governor		
Germond, Norma Jean	See League of Women Voters		
Gesould, Alberta	4128 Davis St. N.E. Portland, OR 97232	65	2.5.6
Giese, Susan	See Oregon Rainbow Coalition		
Goldschmidt, Neil	See Oregon State		
Gorton, Slade	See U.S. Senate		
Greenpeace Charlotte Denniston	11815 - 20th S.W. Seattle, WA 98146	93	2.5.6, 3.3.5.2
Greenpeace Northwest Robert Rose	4649 Sunnyside Ave. North Seattle, WA 98103	230	2.3.1.14, 2.3.2.3, 2.5.5, 2.5.6, 3.1.1.1, 3.1.3.4, 3.1.3.6, 3.1.7.5, 3.3.2.2, 3.3.5.2
Griffiths, Trevor	4240 S.E. Knapp St. Portland, OR 97206	14	2.2.11, 2.3.1.4, 2.3.1.14, 2.5.5, 3.3.4.1, 3.5.5.11, 3.5.5.12
Gurno, Karin	6317 6th Avenue N.E. Seattle, WA 98115	98	3.3.2.1
Hagman, Shirley	123 East Maple Walla Walla, WA 99362	124	2.1.1, 2.3.2.8, 2.3.2.12, 3.3.5.1
Halekas, George and family	Star Route Wauconda, WA 98859	189	2.1.1, 2.2.7, 2.2.13, 2.5.5, 3.1.1.1, 3.1.4.26, 3.3.1.1, 3.3.2.5
Hales, Marilyn	412 Sherman Avenue Coeur d'Alene, ID 83814	228	2.5.6, 3.3.5.1, 3.4.2.2
Hall, Jerrolyn	218 S. Wasson Coos Bay, OR 97420	137	2.1.1, 2.3.1.13, 2.3.2.8, 3.3.1.1
Hamilton, Ida Mae	Rt. 4, Box 132 Vashon, WA 98070	211	2.1.1, 2.1.3, 2.2.1, 2.5.5, 3.1.4.1, 3.3.4.2

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Hanford Education Action League Tim Connor Researcher	South 325 Oak Street Spokane, WA 99204	174	2.1.8, 2.2.1, 2.2.9, 2.2.10, 2.2.13, 2.3.1.14, 2.4.1.1, 2.4.1.8, 2.5.5, 2.5.6, 3.1.2.8, 3.1.3.2, 3.1.3.5, 3.1.3.8, 3.1.4.16, 3.1.4.24, 3.1.4.26, 3.1.4.29, 3.1.4.30, 3.1.5.4, 3.1.5.6, 3.3.2.1, 3.3.4.1, 3.4.2.14, 3.4.3.5, 3.5.3.11, 3.5.3.22, 3.5.4.10, 4.1.18
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Harding, Mr. and Mrs. Goodwin W.	44405 So. Coast Hwy. Neskowin, OR 97149	236	3.3.5.1
Hebner, John R.	See Inland Empire Regional Conference		
Hempstead, Carolyn	24021 S.W. 374 Street Enumclaw, WA 98022	203	2.2.11, 2.4.1.10, 2.5.6
Henterly, Mary	4115 N. Stevens St. Tacoma, WA 98407	34	2.1.1
Heston, Tom	P.O. Box 95722 Seattle, WA 98145-2722	212	2.5.5, 2.5.6
Hill, Orville F.	1510 S.E. 127th Avenue Vancouver, WA	58	2.2.4, 2.2.11, 2.3.2.12, 3.3.3.1
Hill, Vernon R.	Hamlet Rt. Box 1375 Seaside, OR 97138	113	2.5.8, 3.1.8.9, 3.3.4.2
Hirsch, Jack W.	P.O. Box 5186 Bend, OR 97708	20	3.3.5.2, 3.4.2.2
Hodge, Dolores M.	806 South Second Ave. Walla Walla, WA 99362	9	2.1.1, 2.3.2.8, 2.5.6, 3.2.6.1, 3.3.5.2
Hoffmann-Nelson, Mari	4716 Pleasant Hill Rd. Kelso, WA 98626	235	2.1.1
Holdorf, Vivian	7321 39th N.E. Seattle, WA 98115	35	2.1.1, 2.2.1
Hopkins, Kenneth R.	3001 Monta Vista Olympia, WA 98501	100	2.1.1, 3.3.5.1

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Hunt, Byron	643 Pearson Walla Walla, WA 99362	153	2.5.6, 3.3.4.2
Illingworth, Dennis C., R.S.	See Wasco-Sherman Public Health Department		
Inland Empire Regional Conference John R. Hebner, Chairman	Fifth Floor - City Hall Spokane, WA 99201	40	3.3.2.1, 3.4.2.2, 3.4.2.24
James, Marci	1638 N.E. 118th Ave. Portland, OR 97220	28	3.3.5.2
Jeffries, Aileen	P.O. Box 295 Winthrop, WA 98862	161	2.3.1.11, 2.5.9, 3.1.3.4, 3.3.1.9, 3.3.2.1, 3.3.2.5, 3.3.5.3
Johnson, Carl R.	4735 35th Avenue, N.E. Seattle, WA 98105	142	2.1.1, 2.5.5, 3.3.1.1
Johnson, Susan B.	1510 S.W. Elizabeth St. Portland, OR 97201	169	2.2.1, 2.2.10
Jubitz, Nansie	5226 S.W. Northwood Ave. Portland, OR 97201	39	2.3.1.14, 2.3.2.12, 2.5.5
Juntuner, James	2422 S.E. Yamhill Portland, OR 97214	97	2.1.1, 3.5.3.6
Kennewick, City of Bobby F. Kirk Fire Chief	210 West Sixth Avenue P.O. Box 6108 Kennewick, WA 99336	6	3.4.2.24
Kennewick, Port of Sue Watkins, Manager	Port of Kennewick Kennewick, WA 99336	172	2.1.8, 2.2.9, 2.3.2.8, 2.3.2.12, 2.5.8, 3.3.2.1, 3.3.5.3, 3.5.1.2, 3.5.1.8
Kinney, J. Daniel Jr.	703 Beacon Yakima, WA 98901	138	3.3.3.1
Kniesner, Dan L.	11644 SE Morrison Portland, OR 97216	3, 29	3.1.3.25, 3.1.8.9, 3.1.8.13, 3.3.1.1, 3.3.1.4, 3.3.1.10, 3.3.5.4

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Korb, Nancy	13221 S.E. Forest St. Vancouver, WA 98684	42	3.2.4.1, 3.3.1.1, 3.3.2.1
La Morticella, Barbara	18200 N.W. Johnson Rd. Portland, OR 97231	47	2.5.6, 3.3.5.2, 3.4.2.2, 3.4.3.8
Larson, Debra	Box 81 Bay City, OR 97107	31	2.1.1, 2.5.6, 3.3.5.1
Latvala, L. F.	303 W. 9th Street Port Angeles, WA 98362	66	2.1.1, 2.2.12, 2.5.6, 3.3.5.2
Lauman, Sara L.	See Oregon State Public Interest Research Group		
Lawless, W. F. Assistant Professor of Mathematics	Paine Colle 1235 15th Street Augusta, GA 30910	233	2.2.7, 2.2.8, 2.2.13, 2.3.1.13, 2.3.1.14, 2.3.2.9, 2.4.1.2, 2.4.1.3, 2.4.1.6, 2.4.1.8, 2.4.1.9, 3.1.1.11, 3.1.3.2, 3.1.4.4, 3.1.4.29, 3.1.5.8, 3.1.6.1, 3.2.3.5, 3.3.1.2, 3.5.3.11, 3.5.3.12, 4.2.1, 4.2.55
League of Women Voters Ruth Coffin	111 Monroe Center 1810 N.W. 65th Street Seattle, WA 98117	69	2.1.1., 2.1.3, 2.1.7, 2.3.2.2, 2.3.2.10, 2.3.2.12, 3.3.2.1, 3.3.5.7, 3.3.5.8, 4.1.1
League of Women Voters Norma Jean Germond Columbia River Task Force Representative	224 Iron Mountain Blvd. Lake Oswego, OR 97034	64	2.2.1, 2.2.4, 2.4.1.1, 2.4.2.1, 2.5.5, 3.3.1.2, 3.3.2.1, 3.3.4.2, 3.3.5.2, 3.4.2.24, 3.5.1.101, 3.5.6.40
League of Women Voters Helen E. Ramatowski	12714 S.E. Park St. Vancouver, WA 98684	56	2.1.1, 2.1.3, 2.1.7, 2.3.2.10, 2.3.2.12, 2.3.2.2, 3.3.2.1, 3.3.5.7, 3.3.5.8, 4.1.1
Lee, Kai N.	2015 Federal Avenue E. Seattle, WA 98102	4	2.2.1, 2.2.7, 2.2.9, 2.2.11,, 2.3.2.3, 2.3.2.12, 2.5.3, 2.5.5, 3.1.4.30, 3.3.4.1, 3.4.1.1
Leopold, Estella B.	Department of Botany University of Washington Seattle, WA	74	3.5.6.1, 3.5.6.5, 3.5.6.6, 3.5.6.8
Leopold, Opa	5608 17th N.E. Seattle, WA	76	2.4.1.8, 2.5.5, 3.1.1.9
Lewiston, City of Gene Mueller, Mayor	P.O. Box 617 Lewiston, ID 83501	134	3.4.2.2

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Lindberg, Mike	See Portland, City of		
Lindell, Eric J. and Marilyn B.	7028 11th N.W. Seattle, WA 98117	154	2.2.10, 2.2.13, 2.3.1.14, 2.4.1.1, 3.3.2.1
Linn, Dorothy	4617 S.E. 43rd Portland, OR 97206	145	2.1.1, 3.2.4.2, 3.4.2.2
Lohr, Marilyn	5502 S.E. Firwood Milwaukie, OR 97222	202	2.1.1, 2.2.1, 2.2.4, 2.2.14, 2.5.5, 3.2.4.1, 3.4.2.2, 3.5.3.6, 3.5.6.37
Lopez, Cornelius	Route 5, Box 198 Vashon Island, WA 98070	102	2.1.1, 3.3.5.1
Lyons, Lisa	307B East Main Street Walla Walla, WA 99362	119	2.2.1, 2.5.5, 2.5.6, 3.2.6.1, 3.4.3.8
Mabrey, John	See The Dalles, City of		
Maduro, Mimi	1266 S.E. 47th Portland, OR 97215	52	2.2.1, 2.3.2.1, 2.3.2.10, 3.2.6.1
Mangan, Al	W. 2122 Dean Spokane, WA 99201	209	2.3.2.10, 2.5.6, 3.1.2.6, 3.4.2.3, 3.4.2.6, 3.4.2.10, 3.4.2.12, 3.4.2.14, 3.4.2.23, 3.4.2.24, 3.4.2.25, 4.1.10, 4.1.18
Marbet, Lloyd	(No Address)	54	2.3.1.2, 2.3.1.14, 2.5.5, 2.5.6
Mattson, Mary	7273 South 128th Street Seattle, WA 98178	75	2.1.1, 2.5.5, 2.5.6, 3.1.8.10, 3.2.6.1, 3.3.4.2, 3.4.2.2
Mayhew, Faith	See Affiliated Tribes of Northwest Indians		
MAZAMAS Conservation Committee P. J. Oberlander, Chairman	909 Northwest Nineteenth Ave. Portland, OR 97209	10	2.1.10, 2.1.3, 3.1.8.9, 3.3.1.1
McArdle, Betty	See Sierra Club		
McIntosh, Douglas	903 Grant Avenue S. Seattle, WA 98055	165	2.1.1, 3.2.6.1, 3.3.1.1
McIntosh, Heather	11232 11th Ave. S.W. Seattle, WA 98146	159	2.1.1, 2.2.1, 3.4.2.2

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McIntosh, Margretta	11232 11th Ave. S.W. Seattle, WA 98146	160	3.4.3.7
McKeigue, Kevin Democratic Congressional Candidate		82	2.3.2.10, 2.5.5, 2.5.6, 3.3.4.1, 3.4.2.2, 3.4.3.7
McLaughlin, Laine	3446 12th Avenue West Seattle, WA 98119	104	2.1.1, 2.5.5, 2.5.6, 3.4.3.8
McNeill, Vicki	See Spokane, City of		
Miller, Caroline	See Multnomah County, Oregon		
Miller, Joseph L. Jr.	52815 E. Marmot Rd. Sandy, OR 97055	17, 50	2.1.1, 2.5.5, 2.4.1.5, 3.2.3.6, 3.2.4.1, 3.5.4.3
Milne, Thomas L.	See Southwest Washington Health District		
Mintkeski, Walter C. and Vicki G.	6815 S.E. 31st Portland, OR 97202	27	2.1.1, 2.1.9, 2.5.6, 3.3.4.2
Monnier, Milton H.	7940 S.W. Carol Glen Place Beaverton, OR 97007	15	2.3.2.12, 3.3.2.1, 3.3.4.2
Moore, Audrey	53236 E. Marmot Rd. Sandy, OR 97055	198	2.5.5
Moore, Richard D.	53236 E. Marmot Rd. Sandy, OR 97055	183	2.2.9, 3.3.5.2
Mootry, Joan	Rt. 1, Box 554 Spokane, WA 99204	107	2.1.1, 2.1.8, 2.2.1, 2.2.10, 2.3.2.7, 2.4.1.4, 2.4.1.8, 2.5.5, 2.5.6
Morgan, Patricia	615 2nd Street Oregon City, OR 97045	51	2.1.1, 2.2.1, 2.5.5, 2.5.6, 3.4.3.1
Mueller, Gene	See Lewiston, City of		
Muller, Barbara	615 14th Ave. E. #207 Seattle, WA 98112	86	2.1.1, 2.5.6, 3.3.5.1
Multnomah County, Oregon Caroline Miller Commissioner, District 3	County Courthouse Portland, OR 97204	25	2.1.1, 2.2.10, 2.4.1.5, 2.5.6, 3.2.4.1, 3.4.2.3

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Multnomah County, Oregon Charles P. Schade, M.D. Health Officer	Department of Human Services Disease Control Office 426 S.W. Stark St. Portland, OR 97204	175	2.3.1.1, 2.3.1.14, 2.3.2.6, 2.3.2.8, 2.5.4, 2.5.5, 2.5.6, 3.3.1.1, 3.4.2.2, 3.4.3.7
Murphy, Colleen	815 36th Ave. E Seattle, WA 98112	237	2.1.1
Murphy, John L. and Gloria	6546 37th Avenue N.E. Seattle, WA 98115	168	2.1.1, 3.3.5.2
Myers, Evabelle	P.O. Box 582 Green Acres, WA 99016	109	2.1.1, 2.2.14
Natural Resources Defense Council Dan W. Reicher, Attorney	1350 New York Ave., N.W. Washington, DC 20005	240	2.1.4, 2.2.7, 2.3.1.5, 2.3.1.7, 2.3.1.14, 2.4.1.4, 2.4.1.6, 2.4.1.9, 3.1.1.9, 3.1.4.5, 3.1.6.1, 3.3.2.5, 3.4.3.7, 3.5.1.31, 3.5.6.26
Nelson, Dick	See Washington State		
Nez Perce Tribe Nuclear Waste Policy Act Program	Council of Energy Resource Tribes 1580 Logan Street, Suite 400 Denver, CO 80203	234	2.3.1.14, 2.4.1.1, 2.4.1.9, 2.4.2.2, 2.4.2.3, 3.1.3.12, 3.1.6.1, 3.1.8.1, 3.2.4.2, 3.2.5.1, 3.2.6.4, 3.2.6.5, 3.2.6.6, 3.3.1.3, 3.3.3.1, 3.3.4.1, 3.3.5.9, 3.4.1.2, 3.4.1.4, 3.4.2.1, 3.4.2.11, 3.4.3.1, 3.4.3.6, 3.4.3.8, 3.5.1.7, 3.5.1.9, 3.5.1.25, 3.5.1.27, 3.5.2.4, 3.5.2.6, 3.5.2.8, 3.5.2.11, 3.5.2.12, 3.5.2.27, 3.5.3.1, 3.5.4.6, 3.5.5.8, 3.5.5.42, 3.5.6.5, 3.5.6.7, 3.5.6.32, 3.5.6.35, 3.5.6.41, 4.1.1, 4.2.55
Nokes, J. Richard	14650 S.W. 103rd Ave. Tigard, OR 97224	141	2.2.3, 2.2.9, 2.2.14, 2.3.2.8, 3.1.2.5, 3.1.3.25, 3.1.6.1, 3.3.1.1, 3.3.5.3, 3.5.1.7, 3.5.1.8
(No Name)	(No Address)	36	2.5.6
(No Name)	(No Address)	37	2.3.2.12
(No Name)	(No Address)	85	3.4.3.1
North Olympic Peace Fellowship Jennifer Paine	890 Mount Angeles Rd Port Angeles, WA 98362	186	2.1.1, 2.1.3, 2.2.9, 2.2.13, 2.3.1.1, 2.5.5, 2.5.6, 3.3.4.2, 3.3.5.1, 3.4.2.2

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Northwest Citizens Forum on Defense Waste Clarence Barnett Assistant Mayor, City of Yakima	916 So. 17th Avenue Yakima, WA 98902	147	2.1.3, 2.1.8, 2.2.1, 2.2.9, 2.2.13, 2.3.1.3, 2.3.1.13, 2.3.1.14, 2.3.2.7, 2.3.2.8, 2.3.2.9, 2.4.1.7, 2.4.1.19, 3.1.3.26, 3.1.4.1, 3.1.6.1, 3.1.8.16, 3.2.4.1, 3.3.4.2, 3.3.5.3, 3.3.5.5, 3.3.5.6, 3.3.5.7, 3.4.2.12, 3.4.2.13, 3.4.2.24, 3.4.3.7, 3.5.1.1, 3.5.1.3, 3.5.1.56, 3.5.2.6, 3.5.2.9, 3.5.5.5, 3.5.5.7, 3.5.5.42, 4.1.11, 4.1.13, 4.2.18, 4.2.55
Northwest Citizens Forum on Defense Waste Bernard J. Coughlin, SJ	Gonzaga University Spokane, WA 99258	217	2.1.1, 2.1.3, 2.1.7, 2.1.8, 2.1.10, 2.2.1, 2.2.2, 2.2.3, 2.2.9, 2.2.10, 2.2.12, 2.2.13, 2.2.14, 2.3.1.1, 2.3.1.2, 2.3.1.3, 2.3.1.13, 2.3.1.14, 2.3.2.1, 2.3.2.2, 2.3.2.3, 2.3.2.7, 2.3.2.8, 2.3.2.9, 2.3.2.12, 2.4.1.1, 2.4.1.6, 2.4.1.7, 2.4.1.8, 2.4.1.9, 2.4.1.19, 2.4.1.22, 2.5.2, 2.5.6, 3.1.1.1, 3.1.1.9, 3.1.2.5, 3.1.3.4, 3.1.3.7, 3.1.3.13, 3.1.3.25, 3.1.3.26, 3.1.4.1, 3.1.4.5, 3.1.4.14, 3.1.4.30, 3.1.4.33, 3.1.4.35, 3.1.4.37, 3.1.6.1, 3.1.7.2, 3.1.7.6, 3.1.8.9, 3.1.8.16, 3.1.8.18, 3.1.8.20, 3.1.8.21, 3.2.1.3, 3.2.2.6, 3.2.3.4, 3.2.6.7, 3.2.6.8, 3.3.1.1, 3.3.2.1, 3.3.2.3, 3.3.2.4, 3.3.2.5, 3.3.4.1, 3.3.4.2, 3.3.5.2, 3.3.5.3, 3.3.5.4, 3.3.5.5, 3.3.5.6, 3.3.5.7, 3.3.5.8, 3.3.5.9, 3.4.1.3, 3.4.1.5, 3.4.1.7, 3.4.1.11, 3.4.2.2, 3.4.2.7, 3.4.2.12, 3.4.2.13, 3.4.2.24, 3.4.3.7, 3.5.1.1, 3.5.1.3, 3.5.1.7, 3.5.1.8, 3.5.1.21, 3.5.1.56, 3.5.1.57, 3.5.1.59,, 3.5.1.83, 3.5.1.90, 3.5.2.6, 3.5.2.9, 3.5.3.1, 3.5.3.9, 3.5.3.25, 3.5.5.5, 3.5.5.7, 3.5.5.8, 3.5.5.19, 3.5.5.37, 3.5.5.42, 4.1.1, 4.1.3, 4.1.9, 4.1.10, 4.1.11, 4.1.13, 4.2.3, 4.2.18, 4.2.55
Northwest District Association Frank Dixon, President	1819 N.W. Everett, #205 Portland, OR 97209	164	2.1.1, 2.1.3, 2.2.1, 2.2.10, 2.2.11, 2.2.12, 2.2.14, 2.4.1.1, 2.4.1.8, 3.2.4.1, 3.2.6.3, 3.3.2.1, 3.5.3.6, 3.5.5.1, 3.5.5.42
Nutley, Busse	See Washington State		
Oberlander, P. J.	See MAZAMAS Conservation Committee		
Office of the Governor Victor Atiyeh	State Capitol Salem, OR 97310	192	2.2.1, 2.2.9, 2.3.1.13, 3.1.3.25, 3.1.4.5, 3.1.4.30, 3.1.6.1, 3.1.8.9, 3.3.1.1, 3.3.4.2, 3.3.5.3
Office of the Governor John V. Evans	State Capitol Boise, ID 83720	184	2.1.8, 2.3.2.12, 3.1.6.1, 3.3.1.2
Office of the Governor Booth Gardner	State Capitol Olympia, WA	12, 116	2.1.7, 2.2.1, 2.2.3, 2.3.2.8, 2.4.1.1, 2.4.1.17, 2.5.6, 2.5.7, 3.1.6.1, 3.3.2.1, 3.3.5.3, 3.3.5.4, 3.5.1.57

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Oram, Ray Jr.	525 Seamont Lane Edmonds, WA 98020	151	2.2.12, 2.2.13, 2.2.14, 2.3.2.10, 2.5.5, 2.5.6, 3.1.4.28
Oregon Department of Energy A. M. Alsworth, Manager of Reactor Safety	625 Marion St. N.E. Salem, OR 97310	171	2.1.3, 2.2.2, 2.2.9, 2.2.10, 2.2.13, 2.2.14, 2.3.1.7, 2.3.1.13, 2.3.1.14, 2.3.2.1, 2.3.2.2, 2.3.2.3, 2.3.2.7, 2.3.2.8, 2.3.2.12, 2.4.1.8, 2.4.1.15, 2.5.5, 2.5.6, 3.1.1.1, 3.1.1.3, 3.1.1.4, 3.1.1.5, 3.1.1.9, 3.1.3.2, 3.1.3.17, 3.1.3.18, 3.1.3.19, 3.1.3.25, 3.1.3.28, 3.1.4.5, 3.1.4.6, 3.1.4.10, 3.1.4.11, 3.1.4.12, 3.1.4.13, 3.1.4.26, 3.1.4.33, 3.1.6.1, 3.1.8.3, 3.1.8.6, 3.1.8.8, 3.1.8.9, 3.1.8.15, 3.2.2.2, 3.2.4.1, 3.2.4.2, 3.2.4.3, 3.2.6.1, 3.3.1.1, 3.3.1.2, 3.3.1.8, 3.3.1.11, 3.3.2.1, 3.3.2.5, 3.3.2.6, 3.3.2.7, 3.3.2.9, 3.3.3.2, 3.3.4.1, 3.3.4.2, 3.3.5.1, 3.3.5.2, 3.3.5.3, 3.3.5.4, 3.4.1.11, 3.4.2.1, 3.4.2.2, 3.4.2.3, 3.4.2.12, 3.4.2.23, 3.4.2.24, 3.4.2.26, 3.4.3.7, 3.5.1.1, 3.5.1.8, 3.5.1.21, 3.5.1.32, 3.5.1.57, 3.5.1.81, 3.5.1.84, 3.5.1.91, 3.5.1.99, 3.5.2.1, 3.5.2.6, 3.5.2.54, 3.5.3.7, 3.5.3.8, 3.5.4.5, 3.5.4.11, 3.5.5.5, 3.5.5.20, 3.5.6.1, 3.5.6.6, 3.5.6.14, 3.5.6.36, 3.5.6.38, 4.1.2, 4.1.18, 4.1.19
Oregon Department of Energy Lynn D. Frank, Director	625 Marion St. N.E. Salem, OR 97310	53	2.1.1, 2.2.2, 2.2.9, 2.3.1.13, 2.3.1.14, 3.1.2.5, 3.1.3.25, 3.1.6.1, 3.1.8.9, 3.3.1.1, 3.3.5.3, 3.3.5.4, 3.5.1.8, 3.5.5.33
Oregon Hanford Advisory Committee Dan Saltzman, Vice-Chairman		60	2.2.1, 2.2.9, 3.3.1.1, 3.3.3.1, 3.5.6.7, 3.5.6.8
Oregon Rainbow Coalition Susan Giese	P.O. Box 6797 Portland, OR 97212	22	2.2.1, 2.2.13, 2.3.1.3, 2.3.2.8, 3.3.4.2, 3.3.5.4
Oregon State Neil Goldschmidt (Oregon gubernatorial candidate)	1220 S.W. Morrison, Rm 625 Portland, OR 97205	46	2.2.1, 2.2.7, 2.2.9, 2.2.10, 2.4.1.1, 2.4.1.9, 2.5.5, 3.1.1.1, 3.1.8.1, 3.1.8.9, 3.2.4.1, 3.3.1.1, 3.3.1.2, 3.3.2.2, 3.3.4.1
Oregon State Jim Weaver, Congressman	Federal Building 211 East Avenue Eugene, OR 97401	57	2.2.7, 2.2.12, 2.3.1.14, 2.4.1.2, 2.4.1.4, 2.4.1.6, 2.4.1.8, 2.4.2.2, 2.5.6, 3.1.2.5, 3.1.3.25, 3.1.4.5, 3.1.6.1, 3.1.8.2, 3.2.4.1, 3.3.1.1, 3.3.2.1, 3.3.5.1, 3.4.2.2, 3.4.3.1, 3.4.3.7, 3.4.3.8, 3.5.1.100, 3.5.6.6, 4.1.10

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Oregon State Ron Wyden, Congressman	Suite 250, Lloyd 500 Bldg. 500 East Multnomah Portland, OR 97232	55	2.2.1, 2.2.10, 2.2.11, 2.2.16, 2.3.1.14, 2.3.2.2, 2.3.2.8, 2.4.1.1, 2.5.5, 3.2.4.1, 3.3.2.1, 3.5.3.11
Oregon State Public Interest Research Group Sara L. Laumann	027 S.W. Arthur St. Portland, OR 97201	49	2.3.2.8, 2.4.1.5, 3.2.4.1, 3.4.2.2, 3.4.2.12, 3.4.2.22, 3.4.2.24, 3.4.3.8
Orloff, Chet	3315 Northwest Savier St. Portland, OR 97210	139	2.1.1
Paine, Jennifer	See North Olympic Peace Fellowship		
Palmer, Dr. Leonard	See Portland, City of		
Pandah, Inc. Andrew Gardner, President	1212 N.E. Brazee Portland, OR	129	2.2.9, 2.2.10, 2.2.11, 2.2.13, 2.2.14, 2.5.5, 3.2.6.1, 3.3.1.2, 3.3.2.1
Patterson, Claudia E.	Rt. 2, Box 122 Walla Walla, WA 99362	118	2.3.2.8
Perret, Eva	739 35th Ave. Seattle, WA 98122	80	2.2.6, 3.3.5.1
Pierce, Candace	525 Bryant Walla Walla, WA 99362	125	2.1.1, 2.5.5, 2.5.6, 3.4.2.2, 4.1.18
Plaeger, Russell	3025 N.E. 36th Ave. Portland, OR 97212	63	2.1.1, 2.5.6, 3.3.1.1., 3.4.3.1
Porch, Delores	3245 S.E. 136th Ave. Portland, OR 97236	195	3.3.1.1
Portland Chapter of Physicians for Social Responsibility Richard Belsey, M.D.	Oregon Department of Energy Hanford Advisory Committee	61	2.1.8, 2.2.1, 2.2.3, 2.5.5, 3.3.1.1, 3.3.5.7
Portland, City of Dick Bogle, Commissioner	Bureau of Water Works 1120 S.W. 5th Ave. Portland, OR 97204-1926	150	3.2.4.1

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Portland, City of Mike Lindberg, Commissioner Portland City Council	City Hall - 1220 S.W. 5th Portland, OR 97204	59	2.1.1, 2.3.1.2, 2.3.1.12, 2.3.2.9, 2.3.2.10, 2.4.1.1, 2.4.1.5, 2.5.5, 2.5.6, 3.2.6.1, 3.2.6.3, 3.2.6.4, 3.2.6.8
Portland, City of Dr. Leonard Palmer Representative of the Portland City Council Associate Professor Geology	Portland State University Portland, OR 97207	44	2.1.1, 2.2.1, 2.2.13, 2.3.1.2, 2.3.1.3, 2.3.1.12, 2.3.2.9, 2.4.1.1, 2.5.5, 2.5.6, 3.1.6.1, 3.2.2.6, 3.2.4.1, 3.2.6.2, 3.2.6.7, 3.2.6.8, 3.3.1.1, 3.3.5.2, 3.5.1.90, 3.5.1.100, 3.5.2.44, 3.5.3.9, 3.5.6.1, 4.2.10
Portland, City of Margaret D. Strachan Commissioner of Public Utilities	1220 S.W. 5th Portland, OR 97204	214	2.1.1, 2.2.9, 2.2.12, 2.3.1.2, 2.3.2.9, 2.4.1.1, 2.5.5, 3.1.6.1, 3.2.2.6, 3.2.4.1, 3.2.6.1, 3.2.6.3, 3.3.5.2, 3.4.2.2, 3.5.1.90, 3.5.3.6, 3.5.3.9, 3.5.3.11
Portland, City of Edward Tenny, Administrator Bureau of Water Works	1120 S.W. 5th Avenue Portland, OR 97204-1926	45, 133	2.1.1, 2.2.7, 2.3.2.9, 3.2.4.1, 3.3.5.2
Powell, Art	10007 19th Avenue S.W. Seattle, WA 98146	94	3.3.5.2
Powell, Walbridge J.	4314 Island Crest Way Mercer Island, WA 98040	77	2.5.5, 3.4.3.8
Proctor, John	Rt. 1, Box 310-J Drain, OR 97435	8	2.2.1, 2.2.11, 2.3.1.12, 3.3.1.1, 3.3.3.1, 3.5.1.57
Ramatowski, Helen E.	See League of Women Voters		
Raphael, Daniel L.	4823-1/2 Erskine Way S.W. Seattle, WA 98116	89	2.5.6, 3.3.5.2
Rathod, Bonnie	615 S. Washington Port Angeles, WA 98362	131	2.1.1
Reicher, Dan W.	See Natural Resources Defense Council		
Reichlin, Josie E., CSJP	See Sisters of St. Joseph of Peace		
Religious Society of Friends (Quakers) Janet J. Berleman	4312 S.E. Stark St. Portland, OR 97215	152	2.2.3, 2.3.2.8, 2.3.2.9, 2.4.1.5, 2.4.2.1, 2.5.5, 2.5.6, 3.5.3.6

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Riordan, Ruth	2347 N.E. 8th Avenue Portland, OR 97212	135	2.1.1, 2.2.9, 2.5.6, 3.3.5.2, 3.4.2.2
Roberts, Paul	1121 244th Avenue S.E. SP-50 Bothell, WA 98021	81	2.5.8
Rogers, Gordon J.	1108 Road 36 Pasco, WA 99301	13	2.2.4, 2.3.2.12, 2.5.8, 3.1.6.1, 3.3.2.1, 3.5.1.4
Rose, Alan	17109 Scammell Ave. Olympia, WA 98502	87	3.3.5.4
Rose, Robert	See Greenpeace Northwest		
Rosenberg, Richard and Rochelle	3426 N.E. 19th Ave. Portland, OR 97212	114	2.1.1
Rubin, Erica S.	2344 N.E. 19 Portland, OR 97212	21	2.1.1, 2.2.11, 2.3.1.12, 2.5.5
Saltzman, Dan	See Oregon Hanford Advisory Committee		
Save the Resources Committee David Burroughs, President	P.O. Box 692 Port Townsend, WA 98368	216	2.1.3, 2.2.1, 2.2.9, 2.2.13, 2.3.1.1, 2.3.1.14, 2.3.2.2, 2.3.2.3, 2.3.2.8, 2.3.2.9, 2.3.2.10, 2.3.2.11, 2.4.1.1, 2.4.1.8, 2.4.2.1, 2.5.5, 2.5.6, 2.5.7, 3.1.1.1, 3.1.7.2, 3.2.6.5, 3.2.6.8, 3.3.1.1, 3.3.2.2, 3.3.4.2, 3.3.5.1, 3.3.5.2, 3.4.2.2, 3.4.3.7, 3.5.1.2, 3.5.1.3, 3.5.1.30, 3.5.5.3, 3.5.5.11, 3.5.5.29, 3.5.5.32, 3.5.5.37, 3.5.6.1, 4.1.20, 4.1.23
Schade, Charles P.M.D.	See Multnomah County, Oregon		
SEARCH Technical Services Norm Buske	HCR 11 - Box 17 Davenport, WA 99122	206	2.3.2.10, 3.5.3.6, 4.1.20
Seattle King County Nuclear Weapons Freeze Campaign Carole Woods	2925 Fairview E. #15 Seattle, WA 98102	67	2.1.3, 2.2.3, 2.2.13, 2.5.5, 2.5.6, 3.3.4.2
Seattle Women Act for Peace Anci Koppel, Co-Chair	2524 16th South Seattle, WA 98144	73	2.5.5, 2.5.6, 3.3.5.2, 3.4.3.1
Seever, Victoria A.	413 S. Almon #3 Moscow, ID 83843	130	2.1.1, 2.5.5, 2.5.6, 3.4.2.2

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Shively, David	606 Jefferson La Grande, OR 97850	176	2.1.1, 3.2.2.3
Siebe, Carolyn L.	1708 West Brown Pasco, WA 99301	190	3.1.8.9, 3.2.4.1, 3.3.3.1
Sierra Club Regional Vice-Presidents Forum Anne Bringloe, Chairman	Sierra Club Northwest Office 1516 Melrose Avenue Seattle, WA 98122	68	2.2.11, 2.3.2.9, 2.3.2.10, 2.5.5, 3.2.6.3, 3.5.4.8
Sierra Club, Oregon Chapter Nuclear Disarmament Coordinator McArdle, Betty	3740 S.W. Comus St. Portland, OR 97219	219	2.1.1, 2.1.3, 2.1.6, 2.1.9, 2.2.2, 2.2.7, 2.2.9, 2.2.10, 2.2.11, 2.2.13, 2.3.1.3, 2.3.1.7, 2.3.1.13, 2.3.1.14, 2.3.2.1, 2.3.2.3, 2.3.2.9, 2.4.1.1, 2.4.1.6, 2.4.1.8, 2.4.1.9, 2.4.1.15, 2.5.1, 2.5.5, 2.5.6, 3.1.3.4, 3.1.3.17, 3.1.3.19, 3.1.3.25, 3.1.3.28, 3.1.4.30, 3.1.6.1, 3.2.1.3, 3.2.1.9, 3.2.2.2, 3.2.4.1, 3.2.4.2, 3.2.6.3, 3.3.1.1, 3.3.1.2, 3.3.2.5, 3.3.2.7, 3.3.2.9, 3.3.4.1, 3.3.5.7, 3.4.2.2, 3.4.2.24, 3.5.1.7, 3.5.1.8, 3.5.1.31, 3.5.1.32, 3.5.1.84, 3.5.3.6, 3.5.3.11, 3.5.6.6, 3.5.6.8, 4.1.19, 4.1.25
Sisters of St. Joseph of Peace Josie E. Reichlin, CSJP Contact	St. Mary Provincialate 1663 Killarney Way P.O. Box 248 Bellevue, WA 98009-0248	88	2.2.1, 2.2.13, 2.5.6
Southwest Washington Health District Thomas L. Milne Executive Director	Vancouver/Clark County Health Center P.O. Box 1870 2000 Fort Vancouver Way Vancouver, WA 98668	224	2.1.1, 2.1.8, 2.2.14, 3.3.1.1
Spatz, Daniel	17 Sparrow Lane White Salmon, WA 98672	95	2.1.1, 3.2.6.1
Spokane, City of Vicki McNeill, Mayor	Office of the Mayor Fifth Floor City Hall Spokane, WA 99201-3335	1	3.3.2.1, 3.4.2.2, 3.4.2.24
Strachan, Margaret D.	See Portland, City of		
Strahl, Rena M.	9367 S.W. Morrison St. Portland, OR 97225	188	2.1.1, 2.5.6

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Students for Nuclear Awareness Jo Broadwell	705 Division LaGrande, OR 97850	210	2.1.1, 3.4.2.2, 3.4.2.3, 3.4.2.14, 3.4.2.24, 3.4.2.25, 3.4.2.26
Sumner, Dawn Y.	P.O. Box 107 Index, WA 98256	177	2.3.2.9, 3.1.6.1, 3.1.8.6, 3.1.8.7, 3.4.3.7, 3.5.1.8, 3.5.1.95, 3.5.6.1, 3.5.6.4, 3.5.6.8, 3.5.6.9, 3.5.6.14, 3.5.6.32, 3.5.6.47
Sutherland, Dean	See Washington State		
Szulinski, M. J.	1305 Hains Richland, WA 99352	101	2.3.2.12, 2.4.1.8, 2.5.1, 2.5.7, 3.1.2.7, 3.1.3.2, 3.3.1.1, 3.3.2.1, 3.3.3.1, 3.3.4.1, 3.5.5.28
Tauben, David J.	901 Boren, Suite 1776 Seattle, WA 98104	193	2.1.6, 2.2.10, 2.2.12, 2.3.1.1, 2.3.1.14, 2.3.2.9, 2.4.1.8, 2.5.4, 2.5.5, 3.1.1.10, 3.4.3.1, 3.5.5.11, 3.5.5.32, 3.5.5.37
Taylor, Jeanette	Rt. 1, Box 56 Athena, OR 97813	7	2.5.6
Tenny, Edward	See Portland, City of		
The Dalles, City of John Mabrey, Mayor	313 Court Street The Dalles, OR 97058	162	2.1.1, 2.3.2.9, 2.4.1.1, 2.5.5
Thomas, James P.	E. 414 Augusta Avenue Spokane, WA 99207	103	2.2.9, 2.2.10, 2.2.13, 2.3.1.14, 2.3.2.3, 2.5.6, 3.1.1.9, 3.1.3.4, 3.1.4.32, 3.1.5.5, 3.1.6.1, 3.3.1.1, 3.3.5.4, 3.4.2.7
Trapani, Francis	Professor of Clinical Nutrition, Western States College, Portland, OR	123	2.1.1, 2.5.5, 2.5.6, 3.1.4.9, 3.5.4.4
Trapani, Sonia	1405 School Avenue R.R. 6 Walla Walla, WA 99362	122	2.1.1, 2.5.6, 3.3.1.1, 3.3.2.1, 3.3.3.1, 3.3.4.1
Tri-City Industrial Development Council Sam Volpentest Executive Vice President	901 North Colorado Kennewick, WA 99336	128	2.2.1, 2.2.9, 2.3.2.8, 2.3.2.12, 3.1.8.9, 3.3.1.1, 3.3.2.1 3.3.5.4

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United States Department of Commerce David Cottingham Ecology and Conservation Division	National Oceanic and Atmospheric Adm. Washington, DC 20230	241	3.2.4.1, 3.2.4.2, 3.4.2.5
United States Department of Commerce Dale R. Evans Division Chief	National Oceanic and Atmospheric Adm. National Marine Fisheries Service Environmental & Technical Services Div. 847 N.E. 19 Avenue, Suite 350 Portland, OR 97232-2279	238	3.2.4.2, 3.4.2.5, 3.5.4.6
United States Department of the Interior Bruce Blanchard, Director Environmental Project Review	Office of the Secretary Washington, DC 20240	5	3.1.1.1, 3.1.4.1, 3.1.6.1, 3.2.1.6, 3.2.4.2, 3.2.4.3, 3.2.4.6, 3.2.5.1, 3.3.2.5, 3.3.2.8, 3.3.5.4, 3.5.1.57, 3.5.1.60, 3.5.2.47, 3.5.2.48, 3.5.3.16, 3.5.4.6, 3.5.4.8, 3.5.6.7, 3.5.6.12, 3.5.6.37
United States Department of the Interior John R. Woodworth Regional Environmental Officer	Box 043-550-West Fort St. Boise, ID 83724	2	2.3.2.12
United States Environmental Protection Agency David G. Davis, Acting Director Office of Federal Activities	Washington, DC	243	2.2.1, 2.2.5, 2.3.1.13, 2.3.2.3, 2.3.2.4, 2.4.1.1, 2.4.1.8, 2.4.1.9, 2.4.1.14, 2.4.1.16, 2.4.1.20, 2.5.1, 3.1.3.1, 3.1.3.2, 3.1.3.22, 3.1.3.30, 3.1.3.31, 3.1.4.9, 3.1.4.34, 3.1.5.1, 3.1.5.7, 3.1.6.1, 3.2.1.1, 3.2.1.4, 3.2.1.6, 3.2.1.8, 3.2.3.2, 3.2.3.3, 3.3.2.1, 3.3.3.1, 3.3.4.1, 3.3.5.3, 3.3.5.4, 3.4.1.5, 3.4.2.14, 3.4.2.19, 3.4.3.2, 3.4.3.3, 3.5.1.1, 3.5.1.32, 3.5.1.57, 3.5.1.69, 3.5.1.78, 3.5.1.94, 3.5.2.2, 3.5.2.3, 3.5.2.9, 3.5.2.14, 3.5.2.21, 3.5.2.23, 3.5.2.24, 3.5.2.28, 3.5.2.32, 3.5.2.33, 3.5.2.48, 3.5.2.50, 3.5.2.51, 3.5.3.2, 3.5.3.4, 3.5.3.5, 3.5.3.6, 3.5.3.14, 3.5.3.15, 3.5.3.16, 3.5.3.23, 3.5.3.25, 3.5.5.2, 3.5.5.12, 3.5.5.18, 3.5.5.20, 3.5.5.21, 3.5.5.22, 3.5.5.23, 3.5.5.24, 3.5.5.25, 3.5.5.26, 3.5.5.34, 3.5.5.35, 3.5.5.36, 3.5.5.38, 3.5.5.39, 3.5.5.43, 3.5.5.44, 3.5.5.46, 3.5.6.44, 3.5.6.47, 3.5.6.49, 3.5.6.50, 3.5.6.51, 4.1.5, 4.1.10, 4.1.27, 4.2.3, 4.2.4, 4.2.6, 4.2.7, 4.2.12, 4.2.29, 4.2.33, 4.2.43, 4.2.47, 4.2.49, 4.2.55

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United States Nuclear Regulatory Commission Robert E. Browning, Director Division of Nuclear Material Safety and Safeguards	Room 2119 Waterside Mann 401 M Street S.W. Washington, DC 20460	239	2.1.10, 2.2.17, 2.2.18, 2.3.1.14, 2.3.2.1, 2.3.2.3, 2.4.1.9, 2.4.1.23, 2.5.2, 3.1.1.3, 3.1.1.11, 3.1.3.12, 3.1.3.32, 3.1.4.1, 3.1.4.4, 3.1.4.5, 3.1.4.9, 3.1.4.35, 3.2.1.3, 3.2.1.6, 3.2.2.2, 3.2.2.7, 3.2.3.1, 3.2.4.2, 3.2.4.4, 3.2.4.7, 3.2.5.1, 3.3.5.3, 3.3.5.4, 3.4.2.23, 3.5.1.1, 3.5.1.7, 3.5.1.10, 3.5.1.34, 3.5.1.57, 3.5.1.69, 3.5.1.80, 3.5.1.83, 3.5.1.97, 3.5.2.6, 3.5.2.7, 3.5.2.21, 3.5.2.23, 3.5.2.31, 3.5.2.34, 3.5.2.35, 3.5.2.40, 3.5.2.46, 3.5.2.52, 3.5.3.4, 3.5.3.14, 3.5.3.21, 3.5.6.3, 3.5.6.7, 3.5.6.11,
U.S. House of Representatives Les AuCoin	1716 Federal Building 1220 Southwest Third Avenue Portland, OR 97204	43	2.2.1, 2.2.7, 2.2.10, 2.2.13, 2.4.1.1, 3.2.4.1, 4.1.25
U.S. Senate Brock Adams	2114 Fourth Avenue-Suite 203 Seattle, WA 98121	72	2.1.1, 2.2.9, 2.3.2.12, 2.5.6, 3.3.4.2, 3.4.2.2
U.S. Senate Slade Gorton	2988 Federal Building 915 Second Avenue Seattle, WA 98174	111, 112	2.1.1, 2.1.8, 2.2.1, 2.2.9, 2.2.14, 2.3.2.12, 2.4.1.1, 3.1.6.1, 3.3.2.1, 3.3.5.7, 3.4.2.23, 3.4.2.24
Vancouver, City of Carol C. Hansen Management Analyst	City Hall, 210 East 13th St. P.O. Box 1995 Vancouver, WA 98668-1995	173	2.1.1, 2.5.8, 3.5.4.2
Van Dyke, Jane A.	See Clark County Public Utility District		
Volpentest, Sam	See Tri-City Industrial Development Council		
Walenta, John F.	420 N. 39, Apt. 303 Seattle, WA 98103	158	2.1.1, 3.3.1.1, 3.3.4.2
Wallin, Juanita M.	115 Locust Street Walla Walla, WA 99362	18	2.3.2.5, 2.5.5, 2.5.6, 3.3.1.1, 3.3.4.2, 3.4.2.2
Wapato, S. Timothy	See Columbia River Inter-Tribal Fish Commission		
Wasco-Sherman Public Health Department Dennis C. Illingworth, R.S. Supervising Sanitarian	400 East Fifth Street Court House Annex A The Dalles, OR 97058	218	2.1.1, 2.3.2.7, 2.5.6, 3.3.1.1, 3.4.2.24, 3.5.1.98

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Washington Public Interest Research Group (WASHPIRG)	5628 University Way N.E. Seattle, WA 98105	78	2.1.1, 2.2.1, 2.2.3, 2.2.9, 2.2.11, 2.2.12, 2.3.1.2, 2.3.1.14, 2.3.2.3, 2.3.2.8, 2.4.1.1, 2.5.5, 3.1.1.1, 3.1.4.1, 3.3.1.1, 3.3.1.11, 3.3.2.1, 3.3.5.4, 3.3.5.7, 3.5.1.26, 3.5.4.8
Washington State Al Bauer State Senator	401-C Legislative Bldg Olympia, WA 98504	140	2.1.1, 2.1.3, 2.3.2.7, 3.3.4.2
Washington State Don Bonker U.S. Representative	207 Federal Building Olympia, WA 98501	41	2.1.1, 2.2.1, 2.2.10, 2.2.14, 2.3.1.14, 2.4.1.1, 2.4.2.1, 3.1.4.26, 3.3.1.1, 3.3.4.2, 3.3.5.2, 3.4.3.1
Washington State Dick Nelson State Representative	32nd District House Office Bldg. Olympia, WA 98504	156	2.2.9, 2.3.1.8, 2.3.2.8, 2.5.6, 3.1.3.9, 3.3.5.7, 3.4.3.7, 3.5.6.1, 3.5.6.8, 3.5.6.35
Washington State Busse Nutley State Representative	49th District House Office Bldg., Rm 316 Olympia, WA 98504	155	2.1.1, 2.1.9, 2.2.12, 3.1.6.1, 3.2.4.1, 3.3.5.1, 3.5.1.57, 3.5.2.26, 3.5.2.31, 3.5.3.6
Washington State Dean Sutherland State Representative	17th District Legislative Bldg Olympia, WA 98504	232	2.2.1, 2.3.1.13, 3.3.4.2
Washington State Al Williams, Chairman Senate Energy & Utilities Committee	State of Washington	70	2.1.3, 2.1.10, 2.2.1, 2.2.3, 2.3.1.6, 2.3.2.1, 2.3.2.12, 2.4.1.4, 2.5.5, 2.5.9, 3.3.2.1, 3.3.2.4, 3.3.5.4, 3.3.5.7
Washington, State of Warren A. Bishop, Chair Nuclear Waste Board	Mail Stop PV-11 Olympia, WA 98504	223	2.1.1, 2.1.2, 2.1.3, 2.1.6, 2.1.7, 2.1.8, 2.1.10, 2.2.1, 2.2.3, 2.2.7, 2.2.9, 2.2.11, 2.2.15, 2.3.1.3, 2.3.1.4, 2.3.1.7, 2.3.1.8, 2.3.1.9, 2.3.1.10, 2.3.1.11, 2.3.1.12, 2.3.1.13, 2.3.1.14, 2.3.1.15, 2.3.2.2, 2.3.2.3, 2.3.2.7, 2.3.2.8, 2.3.2.10, 2.4.1.1, 2.4.1.4, 2.4.1.9, 2.4.1.10, 2.4.1.11, 2.4.1.12, 2.4.1.13, 2.4.1.14, 2.4.1.16, 2.4.1.17, 2.4.1.18, 2.4.1.19, 2.4.1.22, 2.4.1.24, 2.4.2.2, 2.5.5, 2.5.6, 2.5.7, 3.1.1.6, 3.1.1.10, 3.1.1.11, 3.1.1.12, 3.1.2.4, 3.1.3.1, 3.1.3.3, 3.1.3.9, 3.1.3.11, 3.1.3.12, 3.1.3.15, 3.1.3.20, 3.1.3.23, 3.1.3.27, 3.1.3.29, 3.1.4.1, 3.1.4.5, 3.1.4.15, 3.1.4.17, 3.1.4.18, 3.1.4.19, 3.1.4.22, 3.1.4.25, 3.1.4.26, 3.1.4.28, 3.1.4.32, 3.1.4.36, 3.1.4.37, 3.1.5.3, 3.1.6.1, 3.1.6.2, 3.1.6.3, 3.1.7.3, 3.1.7.4, 3.1.8.1, 3.1.8.4, 3.1.8.12, 3.1.8.17, 3.1.8.19, 3.1.8.22,

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Washington, State of (continued)			3.1.8.23, 3.2.1.2, 3.2.2.1, 3.2.3.4, 3.2.4.2, 3.2.6.3, 3.2.4.3, 3.2.5.1, 3.1.6.3, 3.3.1.1, 3.3.2.1, 3.3.2.4, 3.3.3.1, 3.3.5.2, 3.3.5.3, 3.3.5.4, 3.3.5.7, 3.3.5.10, 3.4.1.1, 3.4.1.3, 3.4.1.9, 3.4.2.2, 3.4.2.3, 3.4.2.4, 3.4.2.5, 3.4.2.9, 3.4.2.13, 3.4.2.15, 3.4.2.16, 3.4.2.17, 3.4.2.20, 3.4.2.21, 3.4.2.22, 3.4.2.24, 3.4.2.25, 3.4.2.26, 3.4.2.27, 3.4.3.7 3.4.3.9, 3.4.3.10, 3.5.1.1, 3.5.1.3, 3.5.1.5, 3.5.1.6, 3.5.1.8, 3.5.1.11, 3.5.1.12, 3.5.1.13, 3.5.1.14, 3.5.1.15, 3.5.1.16, 3.5.1.17, 3.5.1.18, 3.5.1.21, 3.5.1.24, 3.5.1.25, 3.5.1.26, 3.5.1.27, 3.5.1.28, 3.5.1.29, 3.5.1.30, 3.5.1.31, 3.5.1.32, 3.5.1.33, 3.5.1.35, 3.5.1.36, 3.5.1.37, 3.5.1.38, 3.5.1.39, 3.5.1.40, 3.5.1.41, 3.5.1.42, 3.5.1.43, 3.5.1.44, 3.5.1.45, 3.5.1.46, 3.5.1.47, 3.5.1.48, 3.5.1.49, 3.5.1.50 3.5.1.51, 3.5.1.52, 3.5.1.53, 3.5.1.54, 3.5.1.55, 3.5.1.57, 3.5.1.64, 3.5.1.65, 3.5.1.67, 3.5.1.68, 3.5.1.70, 3.5.1.71, 3.5.1.72, 3.5.1.75, 3.5.1.76, 3.5.1.77, 3.5.1.81, 3.5.1.82 3.5.1.83, 3.5.1.84, 3.5.1.86, 3.5.1.91, 3.5.1.92, 3.5.1.96, 3.5.1.99, 3.5.1.100, 3.5.2.6, 3.5.2.9, 3.5.2.10, 3.5.2.15, 3.5.2.16, 3.5.2.17, 3.5.2.20, 3.5.2.25, 3.5.2.30, 3.5.2.35, 3.5.2.37, 3.5.2.39, 3.5.2.41, 3.5.3.2, 3.5.3.6, 3.5.3.16, 3.5.3.21, 3.5.4.3, 3.5.4.6, 3.5.4.7, 3.5.5.4, 3.5.5.9, 3.5.5.13, 3.5.5.16, 3.5.5.18, 3.5.5.32, 3.5.5.39, 3.5.5.40, 3.5.5.41, 3.5.6.1, 3.5.6.10, 3.5.6.12, 3.5.6.15 3.5.6.17, 3.5.6.18, 3.5.6.19, 3.5.6.25, 3.5.6.28, 3.5.6.30, 3.5.6.38, 3.5.6.42, 3.5.6.43, 3.5.6.44, 3.5.6.45, 3.5.6.46, 3.5.6.47, 3.5.6.52, 3.5.6.53, 4.1.1, 4.1.4, 4.1.7, 4.1.10, 4.1.14, 4.1.15, 4.1.16, 4.1.17, 4.1.21, 4.1.24, 4.1.26, 4.2.5, 4.2.8, 4.2.9, 4.2.10, 4.2.11, 4.2.13, 4.2.14, 4.2.15, 4.2.16, 4.2.17, 4.2.19, 4.2.20, 4.2.21, 4.2.22, 4.2.23, 4.2.24, 4.2.25, 4.2.26, 4.2.27, 4.2.28, 4.2.29, 4.2.30, 4.2.31, 4.2.32, 4.2.34, 4.2.35, 4.2.36, 4.2.37, 4.2.38, 4.2.39, 4.2.42, 4.2.44, 4.2.45, 4.2.46, 4.2.48, 4.2.50, 4.2.51, 4.2.52, 4.2.53, 4.2.54, 4.2.55
Wasserman, Alan	1512 Fruitdale Ave. Coeur d'Alene, ID 83814	194	2.5.6, 3.3.5.1, 3.4.2.2
Weaver, Jim	See Oregon State		
Webster, Melissa J.	1235 Isaacs Walla Walla, WA 99362	115	2.1.1, 2.2.12, 2.5.5, 2.5.6, 3.3.5.2
Weiler, C. S.	224 N. Bellevue Ave. Walla Walla, WA 99362	121, 144	2.1.1, 2.1.3, 2.2.7, 2.2.13, 2.2.14, 2.3.2.9, 2.5.5, 2.5.6, 3.3.1.1, 3.3.2.1, 3.3.4.2, 3.3.5.4, 3.4.2.2

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Weiner, Ruth F.	Western Washington University Bellingham, WA 98225	71	2.1.8, 2.2.9, 2.2.10, 2.3.1.1, 2.3.1.14, 2.3.2.1, 2.3.2.2, 2.3.2.3, 2.4.1.1, 3.1.2.5, 3.1.3.7, 3.1.4.5, 3.1.4.14, 3.1.4.25, 3.1.4.35, 3.1.6.1, 3.1.8.9, 3.1.8.10, 3.1.8.18, 3.1.8.21, 3.2.6.8, 3.3.2.3, 3.3.2.4, 3.3.5.7, 3.3.5.9, 3.4.1.7, 3.4.1.11, 3.5.1.21, 3.5.1.56, 3.5.5.8
Williams, Al	See Washington State		
Williams, Kathy	3279 N.E. Davis Portland, OR 97232	24	2.1.9, 2.5.6
Williams, T. D.	900 North 6th Renton, WA 98055	99	3.3.5.1, 3.3.5.2
Willis, Margy E.	4103 S.W. 48th Place Portland, OR 97221	38	2.1.1, 2.5.6, 3.2.2.3, 3.2.6.1, 3.4.2.2, 3.5.5.1
Wood, Richard H.	See Conscience and Military Tax Campaign		
Woodard, Merryl	1580 Skyview Lane N 1 Hayden Lake, ID 83835	213	2.1.1, 3.4.2.2
Woods, Carole	See Seattle King County Nuclear Weapons Freeze Campaign		
Woodworth, John R.	See United State Department of the Interior		
Wyden, Ron	See Oregon State		
Yakima Indian Nation	P.O. Box 151 Toppenish, WA 98948	215	2.1.3, 2.1.6, 2.2.7, 2.2.11, 2.2.14, 2.3.1.9, 2.3.1.13, 2.3.2.1, 2.3.2.12, 2.4.1.6, 2.4.1.8, 2.4.1.9, 2.4.1.16, 2.4.2.2, 3.1.1.1, 3.1.1.2, 3.1.1.3, 3.1.1.7, 3.1.1.8, 3.1.1.11, 3.1.2.1, 3.1.2.3, 3.1.3.3, 3.1.3.9, 3.1.3.10, 3.1.3.11, 3.1.3.12, 3.1.3.24, 3.1.4.1, 3.1.4.5, 3.1.4.8, 3.1.4.13, 3.1.4.20, 3.1.4.21, 3.1.4.22, 3.1.4.23, 3.1.4.26, 3.1.4.27, 3.1.4.30, 3.1.4.31, 3.1.4.32, 3.1.6.1, 3.1.7.2, 3.1.7.6, 3.1.8.5, 3.1.8.11, 3.2.1.5, 3.2.1.7, 3.2.2.4, 3.2.2.5, 3.2.2.8, 3.2.3.1, 3.2.3.2, 3.2.3.5, 3.2.5.1, 3.3.1.4, 3.3.1.5, 3.3.1.9, 3.3.2.5, 3.3.3.1, 3.3.5.1, 3.3.5.2, 3.3.5.3, 3.3.5.4, 3.4.1.1, 3.4.1.3, 3.4.1.6, 3.4.1.8, 3.4.1.10, 3.4.2.1, 3.4.2.8, 3.4.2.18, 3.4.3.2, 3.5.1.19, 3.5.1.20, 3.5.1.22, 3.5.1.23, 3.5.1.30, 3.5.1.31, 3.5.1.36, 3.5.1.57, 3.5.1.58, 3.5.1.61, 3.5.1.62, 3.5.1.63, 3.5.1.64, 3.5.1.66, 3.5.1.71, 3.5.1.73, 3.5.1.74, 3.5.1.75, 3.5.1.78, 3.5.1.79, 3.5.1.87, 3.5.1.88, 3.5.1.89, 3.5.1.93,

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Yosemite, Kifar	1204 Eighth, Apt. 4 La Grande, OR 97850	222	2.1.1, 2.5.6
Youngstrom, Shari	Box 121 Hines, OR 97738	146	2.1.1, 2.3.2.8, 2.5.5, 2.5.6, 3.3.1.1
Zahn, E.	295 Fleet Port Ludlow, WA 98365	185	2.5.6, 3.3.5.4

NUMERICAL LIST FOR PUBLIC COMMENT LETTERS

Comment Letter No.	Reviewer	Affiliation/Address
1	Vicki McNeill, Mayor	Office of the Mayor Fifth Floor City Hall Spokane, WA 99201-3335
2	John R. Woodworth Regional Environmental Officer	Box 043-550-West Fort St. Boise, ID 83724
3	Dan L. Kniesner	11644 SE Morrison Portland, OR 97216
4	Kai N. Lee	2015 Federal Avenue E. Seattle, WA 98102
5	Bruce Blanchard, Director Environmental Project Review	U.S. Department of the Interior Office of the Secretary Washington, DC 20240
6	Bobby F. Kirk, Fire Chief	210 West Sixth Avenue P.O. Box 6108 Kennewick, WA 99336
7	Jeanette Taylor	Rt. 1, Box 56 Athena, OR 97813
8	John Proctor	Rt. 1, Box 310-J Drain, OR 97435
9	Dolores M. Hodge	806 South Second Ave. Walla Walla, WA 99362
10	P. J. Oberlander, Chairman MAZAMAS Conservation Committee	909 Northwest Nineteenth Ave. Portland, OR 97209
11	Jeff Boscole	3425 W. Lake Sammamish Rd. S. Bellevue, WA 98008
12	Governor Booth Gardner	Olympia, WA 98504
13	Gordon J. Rogers	1108 Road 36 Pasco, WA 99301
14	Trevor Griffiths	4240 S.E. Knapp St. Portland, OR 97206
15	Milton H. Monnier Professional Engineer	7940 S.W. Carol Glen Place Beaverton, OR 97007
16	John E. Dennee, President	American Water Works Association Mid Columbia - Deschutes Subsection 6780 Reservoir Road The Dalles, OR 97058
17	Joseph L. Miller, Jr., M.D.	52815 E. Marmot Rd. Sandy, OR 97055

Comment Letter No.	Reviewer	Affiliation/Address
18	Juanita M. Wallin	115 Locust Street Walla Walla, WA 99362
19	D. Kamala Bremer	2222 S.E. Salmon Portland, OR 97214
20	Jack W. Hirsch	P.O. Box 5186 Bend, OR 97708
21	Erica S. Rubin	2344 N.E. 19 Portland, OR 97212
22	Susan Giese	Oregon Rainbow Coalition P.O. Box 6797 Portland, OR 97228-6797
23	John Bartels	P.O. Box 10744 Portland, OR 97210
24	Kathy Williams	3279 N.E. Davis Portland, OR 97232
25	Caroline Miller Commissioner, District 3	Multnomah County, Oregon County Courthouse Portland, OR 97204
26	Jane A. Van Dyke Commissioner	Public Utility District of Clark County 1200 Fort Vancouver Way P.O. Box C-005 Vancouver, WA 98668
27	Walter C. Mintkeski	6815 S.E. 31st Portland, OR 97202
28	Marci James	1638 N.E. 118th Ave. Portland, OR 97220
29	Dan. L. Kniesner	11644 S.E. Morrison Portland, OR 97216
30	Peter Frothingham	3131 N.E. Emerson Portland, OR 97211
31	Debra Larson	Box 81 Bay City, OR 97107
32	Theodore C. Coskey	749 N. 79th Seattle, WA 98103
33	C. Ray Chesbrough	Conservation Plus Windows, Inc. Cascade Business Park 1085 12th Ave. Bldg. D6B Issaquah, WA 98027
34	Mary Henterly	4115 N. Stevens St. Tacoma, WA 98407
35	Vivian Holdorf	7321 39th N.E. Seattle, WA 98115

Comment Letter No.	Reviewer	Affiliation/Address
36	(No Name)	(No Address)
37	(No Name)	(No Address)
38	Margy Willis	4103 S.W. 48th Place Portland, OR 97221
39	Nansie Jubitz	5226 S.W. Northwood Ave. Portland, OR 97201
40	John R. Hebner, Chairman	Inland Empire Regional Conference Fifth Floor - City Hall Spokane, WA 99201
41	Don Bonker U.S. Representative	3rd District Washington State 207 Federal Building Olympia, WA 98501
42	Nancy Korb	13221 S.E. Forest St. Vancouver, WA 98684
43	The Honorable Les AuCoin	2159 Rayburn House Office Building Washington, DC 20515
44	Dr. Leonard Palmer Associate Professor, Geology	Portland State University Portland OR 97207
45	Edward Tenny, Administrator Bureau of Water Works	1120 S.W. 5th Avenue Portland, OR 97204-1926
46	Neil Goldschmidt (Oregon gubernatorial candidate)	1220 S.W. Morrison, Rm. 625 Portland, OR 97205
47	Barbara La Morticella	18200 N.W. Johnson Rd. Portland, OR 97231
48	Rochelle Cashdan, Ph.D.	3649 S.E. Yamhill Portland, OR 97214
49	Sara L. Laumann	Oregon State Public Interest Research Group (OSPIRG) 027 S.W. Arthur St. Portland, OR 97201
50	Joseph L. Miller Jr., M.D.	52815 E. Marmot Rd. Sandy, OR 97055
51	Patricia Morgan	615 2nd Street Oregon City, OR 97045
52	Mimi Maduro	1266 S.E. 47th Portland, OR 97215
53	Lynn D. Frank, Director	Oregon Department of Energy 625 Marion St. N.E. Salem, OR 97310
54	Lloyd Marbet	(No Address)

Comment Letter No.	Reviewer	Affiliation/Address
55	Ron Wyden, Congressman	Portland, Oregon
56	Helen E. Ramatowski	The League of Women Voters of Clark County, Washington 12714 S.E. Park Street Vancouver, WA 98684
57	Jim Weaver, Congressman	4th District, Oregon
58	Orvill F. Hill, Ph.D. Consultant, Nuclear Fuel Cycle	1510 S.E. 127th Ave. Vancouver, WA 98684
59	Mike Lindberg, Commissioner	Portland City Council City Hall - 1220 S.W. 5th Portland, OR 97204
60	Dan Saltzman, Vice-Chairman	Oregon Hanford Advisory Committee
61	Richard Belsey, M.D.	Portland Chapter of Physicians for Social Responsibility Oregon Dept. of Energy Hanford Advisory Committee
62	Ruth Currie	10630 S.W. Lancaster Rd. Portland, OR 97219
63	Russell Plaeger	3025 N.E. 36th Ave. Portland, OR 97212
64	Norma Jean Germond	League of Women Voters 224 Iron Mountain Blvd. Lake Oswego, OR 97034
65	Alberta Gesould	4128 Davis St. Portland, OR 97232
66	L. F. Latvala	303 W. 9th Street Port Angeles, WA 98362
67	Carole Woods	Seattle King County Nuclear Weapons Freeze Campaign 2925 Fairview E. #15 Seattle, WA 98102
68	Anne Bringloe, Chairman	Sierra Club Northwest Office 1516 Melrose Avenue Seattle, WA 98122
69	Ruth Coffin, President	League of Women Voters, Washington 111 Monroe Center 1810 N.W. 65th Street Seattle, WA 98117
70	Al Williams, Chairman	Senate Energy & Utilities Committee State of Washington

Comment Letter No.	Reviewer	Affiliation/Address
71	Ruth F. Weiner	Western Washington University Bellingham, WA 98225
72	Brock Adams	U.S. Senate 2114 Fourth Avenue-Suite 203 Seattle, WA 98121
73	Anci Koppel, Co-Chair	Seattle Women Act for Peace Branch of Women Strike for Peace 2524 16th South Seattle, WA 98144
74	Estella B. Leopold	Department of Botany University of Washington Seattle, WA 98195
75	Mary Mattson	7273 South 128th Street Seattle, WA 98178
76	Opa Leopold	5608 17th N.E. Seattle, WA 98105
77	Walbridge J. Powell Engineer & Geologist	4314 Island Crest Way Mercer Island, WA 98040
78	Washington Public Interest Research Group (WASHPIRG)	5628 University Way N.E. Seattle, WA 98105
79	James Acord	507 Third Avenue - Unit 914 Seattle, WA 98104-2355
80	Eva Perret	739 35th Ave. Seattle, WA 98122
81	Paul Roberts	Fusion Energy Foundation 1121 - 244 S.W. - Sp-50 Bothell, WA 98021
82	Kevin McKeigue Democratic Candidate	U.S. House of Representatives
83	Gary Brill	8504 19th Ave. N.W. Seattle, WA 98117
84	Richard H. Wood	Conscience & Military Tax Campaign 1830 24th Ave. E. Seattle, WA 98112
85	(No Name)	(No Address)
86	Barbara Muller	615 14th Ave. E. #207 Seattle, WA 98112
87	Alan Rose	1710 Scammell Ave. Olympia, WA 98502

Comment Letter No.	Reviewer	Affiliation/Address
88	Josie E. Reichlin, CSJP	St. Mary Provincialate 1663 Killarney Way P.O. Box 248 Bellevue, WA 98009-0248
89	Daniel L. Raphael	4823-1/2 Erskine Way S.W. Seattle, WA 98116
90	Mary Voegtlin Anderson	6844 30th Avenue N.E. Seattle, WA 98115
91	Dorothy Diehl	P.O. Box 441 Mt. Angel, OR 97362
92	Beth Buzzard	2016 E. State Ave. Olympia, WA 98506
93	Charlotte Denniston	Greenpeace 11815 - 20th S.W. Seattle, WA 98146
94	Art Powell	10007 - 19th S.W. Seattle, WA 98146
95	Daniel Spatz	17 Sparrow Lane White Salmon, WA 98672
96	Mr. & Mrs. Robert H. Ferber	9052 39th Ave. S.W. Seattle, WA 98136
97	James Juntuner	2422 S.E. Yamhill Portland, OR 97214
98	Karin Gurno	6317 - 6th N.E. Seattle, WA 98115
99	T. D. Williams	900 North 6th Renton, WA 98055
100	Kenneth R. Hopkins	3001 Monta Vista Olympia, WA 98501
101	M. J. Szulinski	1305 Hains Richland, WA 99352
102	Cornelius Lopez	Route 5, Box 198 Vashon Island, WA 98070
103	James P. Thomas	E. 414 Augusta Avenue Spokane, WA 99207
104	Laine McLaughlin	3446 12th Avenue West Seattle, WA 98119
105	Gerry Bennett	14416 S.E. 37th Bellevue, WA 98006
106	George Erb	16705 Maplewild Ave. S.W. Seattle, WA 98166

Comment Letter No.	Reviewer	Affiliation/Address
107	Joan Mootry	Rt. 1, Box 554 Spokane, WA 99204
108	Kenneth W. Burchell	Spokane, WA 99210
109	Evabelle Myers	P.O. Box 582 Green Acres, WA 99016
110	William Harper Houff, Ph.D.	
111	Slade Gorton U.S. Senator	SH-513 Hart Senate Office Building Washington, DC 20510
112	Dick Ellis, Director Eastern Washington/Senator Gorton	
113	Vernon R. Hill	Hamlet Rt. Box 1375 Seaside, OR 97138
114	Mr. & Mrs. Richard Rosenberg	3426 N.E. 19th Ave. Portland, OR 97212
115	Melissa J. Webster	1235 Isaacs Walla Walla, WA 99362
116	Governor Booth Gardner (Presented by Curtis Eschels, Special Assistant on Energy Issues)	Olympia, WA 98504
117	Gretchen de Grasse	127 Whitman St. Walla Walla, WA 99362
118	Claudia E. Patterson	Rt. 2, Box 122 Walla Walla, WA 99362
119	Lisa Lyons	307B East Main Street Walla Walla, WA 99362
120	Paul H. Yancy	224 N. Bellevue Ave. Walla Walla, WA 99362
121	C. S. Weiler	224 N. Bellevue Ave. Walla Walla, WA 99362
122	Sonia Trapani	1405 School Avenue R.R. 6 Walla Walla, WA 99362
123	Frank Trapani	Portland, OR 97208
124	Shirley Hagman	123 East Maple Walla Walla, WA 99362
125	Candace Pierce	525 Bryant Walla Walla, WA 99362
126	Gregory Adams	(No Address) Tri-Cities

Comment Letter No.	Reviewer	Affiliation/Address
127	Barbara Clark	P.O. Box 1222 Walla Walla, WA 99362
128	Sam Volpentest Executive Vice President	Tri-City Industrial Development Council 901 N. Colorado Kennewick, WA 99336
129	Andrew R. Gardner	1212 N.E. Brazee Portland, OR 97212
130	Victoria A. Seever	413 S. Almon, #3 Moscow, ID 83843
131	Bonnie Rathod	615 S. Washington Port Angeles, WA 98362
132	Mr. & Mrs. Rodger J. Anderson	3644 N.E. 46th Ave. Portland, OR 97213
133	Edward Tenny, Administrator Bureau of Water Works	City of Portland 1120 S.W. 5th Avenue Portland, OR 97204-1926
134	Gene Mueller, Mayor	City of Lewiston P.O. Box 617 Lewiston, ID 83501
135	Ruth Riordan	2347 N.E. 8th Avenue Portland, OR 97212
136	Frederick E. Ellis	P.O. Box 462 Shaw Island, WA 98286
137	Jerrolyn Hall	218 S. Wasson Coos Bay, OR 97420
138	J. Daniel Kinney, Jr.	703 Beacon Yakima, WA 98901
139	Chet Orloff	3315 Northwest Savier St. Portland, OR 97210
140	Senator Al Bauer	49th District 401-C Legislative Bldg. Olympia, WA 98504
141	J. Richard Nokes	14650 S.W. 103rd Ave. Tigard, OR 97224
142	Carl R. Johnson	4735 35th Avenue, N.E. Seattle, WA 98105
143	Paul H. Yancey	224 N. Bellevue Ave. Walla Walla, WA 99362
144	C. S. Weiler	224 N. Bellevue Ave. Walla Walla, WA 99362
145	Dorothy Linn	4617 S.E. 43rd Portland, OR 97206

Comment Letter No.	Reviewer	Affiliation/Address
146	Shari Youngstrom	Box 121 Hines, OR 97738
147	Clarence Barnett Assistant Mayor	Member, NW Citizens Forum on Defense Waste 916 So. 17th Avenue Yakima, WA 98902
148	Michael L. Clark	1008 Prospect Ave. N.E. Olympia, WA 98506
149	Frederick S. Adair Research Analyst	House Energy & Utilities Committee Washington State Legislature Olympia, WA 98504
150	Dick Bogle, Commissioner	Bureau of Water Works 1120 S.W. 5th Ave. Portland, OR 97204-1926
151	Ray Oram, Jr.	525 Seamont Lane Edmonds, WA 98020
152	Janet J. Berleman	Religious Society of Friends (Quakers) 4312 S.E. Stark St. Portland, OR 97215
153	Byron Hunt, D.O.	643 Pearson Walla Walla, WA 99362
154	Eric J. & Marilyn B. Lindell	7028 11th N.W. Seattle, WA 98117
155	Busse Nutley State Representative	49th District House Office Bldg., Room 316 Olympia, WA 98504
156	Dick Nelson State Representative	32nd District House Office Bldg. Olympia, WA 98504
157	Bill Dempsey	325 N.W. Bailey Pendleton, OR 97801
158	John F. Walenta	420 N. 39, Apt. 303 Seattle, WA 98103
159	Heather McIntosh	11232 - 11th Ave. S.W. Seattle, WA 98146
160	Margretta McIntosh	11232 - 11th Ave. S.W. Seattle, WA 98146
161	Aileen Jeffries	P.O. Box 295 Winthrop, WA 98862
162	John Mabrey, Mayor	City of the Dalles 313 Court Street The Dalles, OR 97058

Comment Letter No.	Reviewer	Affiliation/Address
163	Faith Mayhew ATNI Executive Director	Affiliated Tribes of Northwest Indians 1425 N.E. Irving, Suite 102 Portland, OR 97232
164	Frank Dixon President	Northwest District Assoc. 1819 N.W. Everett, #205 Portland, OR 97209
165	Douglas McIntosh	903 Grant Avenue S. Seattle, WA 98055
166	Helen C. Bushman	4835 S.W. Chestnut Pl. Beaverton, OR 97005
167	Lynn W. Baker	3938 N. Overlook Blvd. Portland, OR 97227
168	John L. & Gloria Murphy	6546 - 37th N.E. Seattle, WA 98115
169	Susan B. Johnson	1501 S.W. Elizabeth St. Portland, OR 97201
170	Julie Ann Boyle	Fruitland, WA 99129
171	M. W. Alsworth, Manager of Reactor Safety	Department of Energy 625 Marion St. N.E. Salem, OR 97310
172	Sue Watkins, Manager	Port of Kennewick Kennewick, WA 99336
173	Carol C. Hansen Management Analyst	City of Vancouver City Hall, 210 East 13th St. P.O. Box 1995 Vancouver, WA 98668-1995
174	Tim Connor Staff Researcher	Hanford Education Action League South 325 Oak Street Spokane, WA 99204
175	Charles P. Schade, M.D. Health Officer	Multnomah County Oregon Department of Human Services Disease Control Office 426 S.W. Stark Street Portland, OR 97204
176	David Shively	606 Jefferson La Grande, OR 97850
177	Dawn Y. Sumner	P.O. Box 107 Index, WA 98256
178	S. Timothy Wapato Executive Director	Columbia River Inter-Tribal Fish Commission 975 S.E. Sandy Blvd., Suite 202 Portland, OR 97214

Comment Letter No.	Reviewer	Affiliation/Address
179	F. S. Bayley	900 University St. 6A Seattle, WA 98101-2728
180	Roger C. Brown, Ph.D., CHP	Rt. #1, Box 1629 Benton City, WA 99320
181	Patricia M. Carpenter & Family	Rt. #1, Box 1799 Hermiston, OR 97838
182	Jalair L. Box	1231 N.E. 92nd St. Seattle, WA 98115
183	Richard D. Moore, M.D.	53236 E. Marmot Rd. Sandy, OR 97055
184	John V. Evans Governor	Office of the Governor State Capitol Boise, ID 83720
185	E. Zahn	295 Fleet Port Ludlow, WA 98365
186	Jennifer Paine	North Olympic Peace Fellowship 890 Mount Angeles Road Port Angeles, WA 98362
187	Diana Bradshaw	Audubon Society of Portland 5151 Northwest Cornell Road Portland, OR 97210
188	Rena M. Strahl	9367 S.W. Morrison St. Portland, OR 97225
189	George Halekas & Family	Star Route Wauconda, WA 98859
190	Carolyn L. Siebe	1708 West Brown Pasco, WA 99301
191	Ann Bradford	Coeur d'Alene, ID 83814
192	Victor Atiyeh Governor	Office of the Governor State Capitol Salem, OR 97310
193	David J. Tauben, M.D.	901 Boren, Suite 1776 Seattle, WA 98104
194	Alan Wasserman	1512 Fruitdale Ave. Coeur d'Alene, ID 83814
195	Delores Porch	3245 S.E. 136th Ave. Portland, OR 97236
196	Pam D. Gardine	7846 Houser Lake Rd. Post Falls, ID 83854
197	Nick Arnis	P.O. Box 604 Portland, OR 97207

Comment Letter No.	Reviewer	Affiliation/Address
198	Audrey Moore	53236 E. Marmot Rd. Sandy, OR 97055
199	Pamela C. Behring	1418 E. 13th Spokane, WA 99202
200	Christy A. Crandall	2134 N.E. 51st St. Portland, OR 97213
201	Marilyn Couch	1705 N.W. 32nd Portland, OR 97210
202	Marilyn Lohr	5502 S.E. Firwood Milwaukie, OR 97222
203	Carolyn Hempstead	24021 S.W. 374 Street Enumclaw, WA 98022
204	Gary Bickett	15105 Twin Fir Rd. Lake Oswego, OR 97034
205	Peter Ford	704 S.E. 15th Portland, OR 97214
206	Norm Buske	SEARCH Technical Services HCR 11 - Box 17 Davenport, WA 99122
207	Robbie Earon Conservation Chair	Salem Audubon Society P.O. Box 17873 Salem, OR 97305
208	Philip L. Bereano Associate Professor	E.I.C.P. FH-40 University of Washington Seattle, WA 98195
209	Al Mangan	W. 2122 Dean Spokane, WA 99201
210	Jo Broadwell	Students for Nuclear Awareness 705 Division La Grande, OR 97850
211	Ida Mae Hamilton	Rt. 4, Box 132 Vashon, WA 98070
212	Tom Heston	P.O. Box 95722 Seattle, WA 98145-2722
213	Merryl Woodard	1580 Skyview Lane N 1 Hayden Lake, ID 83835
214	Margaret D. Strachan Commissioner of Public Utilities	City of Portland 1220 S.W. 5th Portland, OR 97204
215	Yakima Indian Nation	c/o Russell Jim Nuclear Waste Program P.O. Box 151 Toppenish, WA 98948

Comment Letter No.	Reviewer	Affiliation/Address
216	David Burroughs, President	Save the Resources Committee P.O. Box 692 Port Townsend, WA 98368
217	Bernard J. Coughlin	Gonzaga University Spokane, WA 99258
218	Dennis C. Illingworth R.S. Supervising Sanitarian	Wasco-Sherman Public Health Department 400 East Fifth Street Court House Annex A The Dalles, OR 97058
219	Betty McArdle	3740 S.W. Comus St. Portland, OR 97219
220	Terri L. Barfield	817 - 14th Way Edmonds, WA 98020
221	Gerald H. Bosch	648 S. Booker Rd. Othello, WA 99344
222	Kifar Yosemite	1204 Eighth, Apt. 4 La Grande, OR 97850
223	Warren A. Bishop, Chair Nuclear Waste Board	State of Washington Mail Stop PV-11 Olympia, WA 98504
224	Thomas L. Milne Executive Director	Southwest Washington Health District Vancouver/Clark County Health Center P.O. Box 1870 2000 Fort Vancouver Way Vancouver, WA 98668
225	Marilyn Christofferson	817 14th Way Edmonds, WA 98020
226	John R. Christofferson	817 14th Way Edmonds, WA 98020
227	Karen Cotton	Silver Beach Coeur d'Alene, ID 83814
228	Marilyn Hales	412 Sherman Avenue Coeur d'Alene, ID 83814
229	Heidi M. Edinger	S. 2335 Silver Beach Coeur d'Alene, ID 83814
230	Robert Rose	Greenpeace Northwest 4649 Sunnyside Ave. North Seattle, WA 98103
231	William H. Burke, Director Umatilla Nuclear Waste Study Program	Confederated Tribes of the Umatilla Indian Reservation P.O. Box 638 Pendleton, OR 97801

Comment Letter No.	Reviewer	Affiliation/Address
232	Representative Dean Sutherland 17th District	Legislative Building Olympia, WA 98504
233	W. F. Lawless Assistant Professor of Mathematics	Paine College 1235 15th Street Augusta, GA 30910
234	Nez Perce Tribe Nuclear Waste Policy Act Program	Council of Energy Resource Tribes 1580 Logan Street, Suite 400 Denver, CO 80203
235	Mari Hoffmann Nelson	4716 Pleasant Hill Rd. Kelso, WA 98626
236	Mr. & Mrs. Goodwin W. Hardin	44405 So. Coast Hwy. Neskowin, OR 97149
237	Colleen Murphy	815 36th Ave. E Seattle, WA 98112
238	Dale R. Evans Division Chief	U.S. Department of Commerce National Oceanic and Atmospheric Adm. National Marine Fisheries Service Environmental & Technical Services Div. 847 N.E. 19th Avenue, Suite 350 Portland, OR 97232-2279
239	Robert E. Browning, Director Division of Nuclear Material Safety and Safeguards	U.S. Nuclear Regulatory Commission Washington, DC 20555
240	Dan W. Reicher, Attorney	Natural Resources Defense Council 1350 New York Ave., N.W. Washington, DC 20005
241	David Cottingham Ecology and Conservation Division	U.S. Department of Commerce National Oceanic and Atmospheric Adm. Washington, DC 20230
242	Robert Alvarez Director, Nuclear Project	Environmental Policy Institute 218 D Street, S.E. Washington, DC 20003
243	David G. Davis Acting Director Office of Federal Activities	U.S. Environmental Protection Agency Washington, DC 20460

APPENDIX B

INDEX FOR PUBLIC TESTIMONY

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APPENDIX B

INDEX FOR PUBLIC TESTIMONY

Name	Hearing No.	Comment No. in Volume 4
PUBLIC HEARING LOCATION: RICHLAND, WASHINGTON		
Adams, Greg	313	3.2.6.3
Baird, Alma	346	2.1.1
Caldwell, Larry	302	3.1.1.10
Carlson, Bill	341	2.1.1
Clark, Barbara	316	See letter No. 127
Degrasse, Gretchen	303	See letter No. 117
Drovhard, Norb	322	2.1.1, 3.3.1.1
Dupuy, Robert	324	2.5.8
Eagon, Kris	332	2.1.1, 2.5.6
Eschels, Curtis	301	See letter No. 116
Gierman, Milissa	319	2.3.2.5. 2.5.5
Hagman, Sonia/Shirley	307	See letter No. 124
Hammond, Dick	314	2.2.4
Haymaker, Alton	313	2.2.1
Hodge, Delores	309	See letter No. 9
Hoffman, Helina	333	2.2.4
Holtzner, George	325	2.5.8
Hunt, Byron	312	See letter No. 153
Isaacson, Ray	342	3.5.1.71
Jensen, Harry	336	3.3.2.1
Kaveckis, Joe	317	2.2.4
Kilbury, Charles A.	315	3.3.1.1
Lyons, Lisa	306	See letter No. 119
Mason, Brad	321	3.3.1.1
McSpadden, Carolyn	345	3.3.1.1
McSpadden, William	335	3.3.2.1
Nichol, Soozie (sic)	339	2.1.1
Patterson, Claudia	304	See letter No. 118
Pierce, A. L.	323	2.1.5, 3.3.1.6
Pierce, Candace	310	See letter No. 125
Pixley-Bell, LaVonne	334	2.1.1
Quapp, William	343	3.3.1.1
Reis, Debbie	327	2.3.2.8
Ripfel, Hans C. F.	338	2.2.4
Rodgers, Gordon	328	2.2.4

Name	Hearing No.	Comment No. in Volume 4
PUBLIC HEARING LOCATION: RICHLAND, WASHINGTON (contd)		
Seachris, Carolyn	344	2.3.2.8, 3.3.1.1
Settle, Robert	320	2.3.2.5, 2.5.5
Shatell, Charles	340	3.3.1.1
Swenson, Leon	331	2.1.1
Thomas, Linda	311	2.3.2.5, 3.2.6.3
Trapani, Francis	326	See letter No. 123
Trapani, Sonia	305	See letter No. 122
Volpentest, Sam	318	See letter No. 128
Wallace, Bob	337	4.1.1
Webster, Melissa	308	See letter No. 115
Weiler, Susan	329	See letter No. 121
Yancey, Paul	330	See letter No. 120
PUBLIC HEARING LOCATION: PORTLAND, OREGON		
Allen, Rick	458	2.1.1
Armos, Iris	419	2.1.1, 2.5.6
Aucoin, Les	405	3.3.1.1
Bailey, James	428	2.1.1, 2.2.4, 2.5.6, 3.3.1.1
Bailey, Kathryn	452	2.5.6
Bauman, Rick	436	2.5.6
Beaman, Tom	476	2.1.1
Beckett, Gary	423	See letter No. 4
Bell, Charles	411	2.5.6
Belsey, Dick	450	See letter No. 61
Bogdanski, Jack	408	2.5.5, 3.2.4.1, 3.2.6.1, 3.5.1.30
Brayden, Bill	463	3.3.5.2
Canon, Bell	460	2.5.6
Canon, Jim	415	3.3.1.1
Clark, Bud	438	2.1.1, 2.2.4
Cohen, Joyce	412	2.2.11, 3.1.6.1, 3.3.1.1, 3.3.5.4
Collins, Austin	454	No comment identified
Cook, Jim	472	2.5.6
Copeland, Liz	466	2.4.1.1
Couch, Marilyn	413	2.1.1, 2.2.4
Currie, Ruth	453	See letter No. 62
Davis, Mark	421	2.2.11, 2.5.6
Deanert, Bill	471	2.5.6
Dempsey, Bill	475	3.1.4.1

Name	Hearing No.	Comment No. in Volume 4
PUBLIC HEARING LOCATION: PORTLAND, OREGON (contd)		
Dragoon, Ken	468	2.5.5
Ernst, Carolyn	418	2.1.1
Fawbush, Wayne	430	2.5.6
Forthran, Robert	467	No comment identified
Frank, Lynn	401	See letter No. 53
Gardner, Drew	431	2.5.6
Germond, N. J.	407	See letter No. 64
Gillespie, Ann	462	2.5.6
Goldschmidt, Neil	434	See letter No. 46
Hill, Orv	425	3.3.3.1
Hodge, Ken	427	2.1.1
Johnson, Lee	420	3.2.6.1
Johnson, Robert	469	2.1.1, 2.5.6
Kaufman, Toby	441	2.3.1.11
Korb, Nancy	414	2.2.9, 3.1.4.9, 3.3.1.1
Lauman, Sara	446	2.2.4
Lesley, Katheryn	442	2.1.1
Long, Dan	417	2.2.4, 2.5.6
Madill, Janet	416	3.3.1.1
Maduro, Mimi	465	See letter No. 52
Marbet, Lloyd	414	3.1.4
Matthias, Catherine	444	2.5.6
McLaughlin, Barbara	445	2.5
Miller, Joseph	451	2.1.1
Miller, Tom	424	2.5.6, 3.3.1.1
Morgan, Patricia	455	2.1.1, 2.5.6
Morticella, Barbara	439	2.1.1
Nesewich, Nancy	433	2.2.4, 3.3.1.7, 3.3.2.1
Newhouse, Dave	422	2.5.6
Nostel, Don	459	2.5.6
Oleksiak, Joan	432	2.5.6
Packwood, Bob	402	2.1.1
Palmer, Leonard	429	See letter No. 4
Paulus, Norma	410	2.1.1, 2.5.6
Pitt, Louie Jr.	448	2.1.1
Plaeger, Russ	409	2.5.6
Ramatowski, Helen	426	See letter No. 56
Raymond, Jean	457	2.5.6
Saltzman, Dan	435	2.5.5, 3.3.1.1

Name	Hearing No.	Comment No. in Volume 4
PUBLIC HEARING LOCATION: PORTLAND, OREGON (contd)		
Sasell, Joan	473	2.1.1, 2.5.6
Sharkey, Doug	474	2.3.1.7, 2.5.6
Siboda, Carol	449	2.5.6
Silver, Erika	443	2.1.1, 2.5.6
Stevens, Michael	464	2.5.6
Strachan, Margaret	437	3.2.6.3
Taylor, ?	470	No comment identified
Thomasson, Katherine	447	2.5.5, 2.5.6
Tuttle, Larry	440	3.1.6.1
Weaver, Jim	404	See letter No. 57
Weesen, Kathryn	461	2.1.1
Weitzman, Hale	406	2.5.6
Williams, Paul	456	2.1.1, 3.3.4.2
Wyden, Ron	403	See letter No. 55
PUBLIC HEARING LOCATION: SEATTLE, WASHINGTON		
Accord, James	558	See letter No. 79
Adams, Brock	515	See letter No. 72
Anderson, Mary	519	See letter No. 90
Bartlett, John	520	2.5.6
Bennett, Suzanne	560	3.3.1.1
Bereano, Phillip	513	See letter No. 208
Bishop, Warren	501	See letter No. 223
Boersma, Cindy	564	2.1.1
Box, Jalair	540	2.5.6
Bringloe, Ann	506	2.2.11
Buchanan, Tom	511	2.5.6
Chrisman, Neil	512	3.3.2.5
Coffin, Ruth	507	See letter No. 56
Coskey, Ted	505	See letter No. 32
Coveny, Sandra	551	2.5.6
Cummings, James	553	2.5.6
Dorn, Duane	537	2.5.6
Douthwaite, Jeff	536	2.5.6
Ellis, Fred	527	See letter No. 136
Gard, Catherine	562	2.1.1
Goltz, Barney	516	3.3.4.2
Hastings, David	522	2.5.6

Name	Hearing No.	Comment No. in Volume 4
PUBLIC HEARING LOCATION: SEATTLE, WASHINGTON (contd)		
Helstein, Beth	544	2.2.11, 2.5.6
Heston, Tom	549	2.5.6
Howard, Keith	532	2.5.6
Jamison, Ian	546	2.5.6
Koppell, Anci	523	2.1.5, 2.5.6, 3.3.1.1, 3.3.1.6
Leopold, Estella	524	See letter No. 74
Leopold, Opa	525	See letter No. 76
Lindquist, Reese	508	2.1.1
Lyons, Dana	533	2.1.1
Lyons, Zack	548	2.5.6
Martin, Tom	517	3.3.4.2
Mattson, Mary	526	See letter No. 75
McHugh, Tim	552	2.1.1
McKeigue, Kevin	514	3.3.4.2
Merkel, Joel	503	See letter No. 217
Myslis, Sarah	545	2.5.6
Nelson, Dick	539	See letter No. 156
Oram, Ray	556	2.5.5
Paine, Jennifer	528	See letter No. 186
Parrott, Eva	567	3.3.4.2
Pfaff, John	561	2.1.1
Pollett, Gerald	550	2.2.10, 3.3.5.7
Pottharst, Ed	542	2.1.1, 2.2.7, 3.1.4.26
Powell, Walbridge	529	See letter No. 77
Purser, Craig	566	2.1.1
Ravve, Becka	565	2.5.6
Reid, Walter	543	2.5.5, 2.5.6, 3.3.1.8, 3.3.2.4
Riniker, Andrea	502	See letter No. 223
Rose, Bob	518	2.3.1.4, 2.5.6, 3.1.3.6
Shook, Peter	541	2.5.6
Skerrett, Art	555	No comment identified
Stevenson, Mark	534	2.2.7, 2.5.6
Stewart, David	547	3.3.5.2
Sursely, Colleen	530	3.3.4.2
Tarnas, David	559	2.3.2.9, 2.4.2.2, 2.5.6
Todd, Mike	538	2.3.1.10, 3.3.4.2, 3.3.5.7
Wardlowe, Michael	531	2.3.2.10
Weiner, Ruth	510	See letter No. 71
Wells, John	557	2.5.5, 3.1.4.28, 3.5.5.42

Name	Hearing No.	Comment No. in Volume 4
PUBLIC HEARING LOCATION: SEATTLE, WASHINGTON (contd)		
Williams, Al	509	See letter No. 70
Wolf, Hazel	535	2.5.6
Wood, Rich	521	See letter No. 84
Woods, Carol	504	See letter No. 67
Yegge, Jennifer	563	2.3.2.8
Zapada, Barbara	554	No comment identified
PUBLIC HEARING LOCATION: SPOKANE, WASHINGTON		
Armagost, Dean	660	2.5.6
Armstrong, Frank	617	3.3.4.2
Attwood, Wayne	618	2.2.11, 2.5.6
Baird, Kenneth	620	2.1.1
Barney, Bill	647	2.5.5
Beetle, Deborah	652	2.5.6
Berg, Virginia	619	2.1.1, 2.1.5, 2.2.11, 2.5.5, 3.3.1.6, 3.3.4.2
Bond, Dory	654	2.1.1
Boyle, Julie	628	See letter No. 170
Brannon, Steven	641	2.1.1
Camp, Lois	635	2.5.6
Clegg, Donald	630	2.5.6
Cochran, Sara Sue	653	2.1.1
Conner, Tim	604	2.1.1, 2.3.2.8, 2.5.5
Cossovant, Ken	605	3.2.6.3
Cox, Enid	612	3.3.1.1
Delaney, Helen	606	2.3.2.5, 2.5.5, 3.3.2.1, 3.3.5.7, 3.5.1.83
Ellis, Richard	601	2.2.1
Feeny, Kendell	649	2.5.6
Givern, Lila	656	2.5.6
Guess, Sam	634	2.2.4
Houff, William	602	See letter No. 110
Ingebo, Myron	650	2.1.1, 3.3.4.2
Irving, Bill	651	2.2.1
Jabonski, Eugene	621	3.1.4.28
Jackson, Sally	643	2.5.5
Jacob, Marge	613	3.5.5.42
Jensen, Janice	616	2.1.1

Name	Hearing No.	Comment No. in Volume 4
Jordan, Zorana	640	2.1.1, 2.3.2.8, 3.4.2.24
Kuntz, Don	627	2.1.1, 3.1.1.10, 3.1.3.16, 3.1.4.3 3.1.8.9, 4.1.10
Lewis, Tim	644	2.5.5, 2.5.6
Little, Liz	645	2.1.1, 2.5.6
Lunceford, Christine	648	2.1.1
Lyons, Dana	629	2.1.1
Lyons, Zack	639	2.1.1
Magnuson, Tracy	633	2.2.11, 3.3.4.2, 3.5.5.10
Managan, Al	626	See letter No. 209
McFadden, Katie	655	2.1.1
Miller, Stan	631	2.5.6
Mootry, Joan	608	See letter No. 107
Myslis, Sarah	642	2.5.6
Nettleton, Bill	611	3.1.3.11, 3.3.5.2
Notham, Lane	625	See letter No. 78
Nules, Mike	623	2.5.5
Polek, Jan	638	2.1.1
Price, Ann	622	2.5.5, 2.5.6
Rapplege, Kent	615	3.3.1.1
Richardson, Rocky	659	2.1.1
Scott, Donald	637	2.5.6
Senske, Bill	646	2.1.5, 3.3.1.6, 3.3.4.2
Stapleton, Joe	610	3.4.2.24
Stephen, Ross	658	2.5.6
Stratton, Lois	614	2.3.2.8
Swan, Ed	632	2.5.5
Sweeney, Dennis	636	2.5.5
Taylor, Ren	607	2.5.5
Thomas, Jim	603	See letter No. 103
Wells, Maxine	624	2.3.2.8, 2.5.5
Wilsey, David	609	No comment identified

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