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TRANSURANIC RADIONUCLIDES IN THE ENVIRONMENT SURROUNDING RADIOACTIVE WASTE DISPOSAL SITES, A BIBLIOGRAPHY

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Abstract:

The purpose of this project was to compile a bibliography of references containing environmental transuranic radionuclide data. Our intent was to identify those parameters affecting transuranic radionuclide transport that may be generic and those that may be dependent on chemical form and/or environmental conditions (i.e. site specific). An understanding of the unique characteristics and similarities between source terms and environmental conditions relative to transuranic radionuclide transport and cycling will provide the ability to assess and predict the long term impact on man and the environment. An additional goal of our literature review, was to extract the ranges of environmental transuranic radionuclide data from the identified references for inclusion in a data base. Related to source term, these ranges of data can be used to calculate the dose to man from the radionuclides, and to perform uncertainty analyses on these dose assessments.

In an attempt to gather relevant information about the transuranic radionuclides in a variety of environments, we conducted an extensive literature search. In our literature search we identified over 5700 potential written sources of information for review. In addition, we have identified many references which were not found through the literature searches, but which were known to contain useful data. A total of approximately 2600 documents were determined to contain information which would be useful for an in depth study of radionuclides in different environments. The journal articles, books, reports and other documents were reviewed to obtain the source term of the radionuclides studied. Most references containing laboratory study data were not included in our databases. Although these may contain valuable data, we were trying to compile references with information on the behavior of the transuranics in the specific environment being studied.

On the basis of our reviews, we have arbitrarily outlined five general source terms. These are fallout, fuel cycle waste, accidents, disposal sites and resuspension. Resuspension of the transuranic radionuclides is an unique source term, in that the radionuclides can originate from any of the other source terms. If these transuranic radionuclides become resuspended into the air, they then become important as a source of inhaled radionuclides. This bibliography is a compilation of the references containing studies of plutonium and americium released to the environment in the area of radioactive waste disposal sites.

Introduction:

The issue of transuranic radionuclides in the environment has been the subject of extensive research. For approximately five decades, plutonium and americium have been dispersed into the environment, resulting in widespread low level contamination of soil, water, plants and animals. To compare the transport, uptake, cycling and resuspension of plutonium and americium from various

source terms around the world, it was necessary to summarize information from studies of these radionuclides in different environments. Some logical method of categorizing the source of the transuranic radionuclides had to be devised to use the data from the studies in a predictive manner. Our first task was to identify the source terms which we considered to be of primary importance.

The introduction of transuranic radionuclides into the environment in the area of radioactive waste disposal sites is an important source term. Many of these areas have been extensively studied as a result of high levels of transuranic radionuclides found in the general area. Evaluating the behavior of the transuranic radionuclides in aquatic, terrestrial and atmospheric ecosystems affected by these accidents, has been the focus of many studies.

The data concerning these disposal sites, includes analyses of different isotopes in different environmental media in different locations. Using these data, we hope to gain a better understanding of the transuranic radionuclide transport, cycling, uptake, and resuspension to evaluate site specific and generic applications.

Methods and Results:

We began by searching several large on-line databases using keywords which we had identified as relevant to transuranic radionuclide transport, uptake and cycling in the environment. These searches were performed from June through September 1992.

The Energy Data Base was the first on-line database we searched. Using our original keyword strategy, the original number of identified items was only 869. On the basis of each abstract provided with the search, only 516 seemed to contain the kind of information relevant to our goals. We adjusted our keyword list by both expanding some areas, and narrowing the focus in others. A second search of the Energy Data Base produced an additional 4258 titles. About 1700 of these items were determined to be of interest.

Next, we expanded our search to the Chem Abstracts Data Base. This search yielded 969 items. Some of these had already been identified through the Energy Data Base searches. In addition to the references identified in our on-line searches, we were already in possession of several references known to contain useful data. A final search was performed with the intent of yielding these known references. This assured us that our keyword list was in fact producing the intended result.

After the final search was completed, we began to obtain all of the identified references. As these were obtained, the reference list at the end of each document was checked for additional references that had not been previously

identified. This resulted in further titles being added to our bibliographic database.

To produce our bibliography and environmental source term databases, we have used two commercially available software packages. ProCite ver. 2.0 for the Macintosh was used to produce the bibliography. The source term database was produced using dBase IV, ver. 1.5 on an IBM PS/2. The two different software packages were cross referenced to each other using a common field. The dBase IV database was used to keep track of the information extracted from the references. This allowed us to sort the references using a variety of criteria.

Discussion:

This bibliography is an attempt to provide a resource for information on the behavior of transuranic radionuclides in the environment near radioactive waste disposal sites. Our final on-line database search was in September 1992. There may be additional references of interest in these on-line databases which have been added since that time. References identified by other methods have been included through July 1993.

Bibliography

- Aarkrog, A., "Long-Lived Radionuclides Important in Marine Waste Disposal," *Behaviour of Long-Lived Radionuclides Associated with Deep-Sea Disposal of Radioactive Wastes*, IAEA, Vienna, IAEA-TECDOC-368, (1986).
- Aarkrog, A. and H. Dahlgaard, "Intercomparison Studies of Transuranics in North Atlantic Deep Sea Sediments from the NEA Dumpsite," *Behaviour of Long-Lived Radionuclides Associated with Deep-Sea Disposal of Radioactive Wastes. Report of a Co-Ordinated Research Programme Organized by the International Atomic Energy Agency 1982-1984*, International Atomic Energy Agency, Vienna, IAEA-TECDOC-368, (1986).
- Adriano, D.C., A. Wallace and E.M. Romney, *Uptake of Transuranic Nuclides from Soil by Plants Grown Under Controlled Environmental Conditions*. DOE/TIC-22800, (1980).
- Adriano, D.C., K.W. McLeod and T.G. Ciravolo, "Long-Term availability of curium and plutonium to crop plants," *Health Phys*, Vol. 50, 647-651, (1986).
- Adriano, D.S., D.S. Korej and R.S. Dalmen, "Plutonium Content in Field Crops Yield at South-East of USA. Chapter 9," *Transuranic Elements in the Environment*. U.S. Khehnson, Ed., (1985), pp. 188-207.
- Alexander, W.A., T.W. Oakes, J.S. Eldridge, S. Huang and H.M. Hubbard, *Radionuclide Characterization of Subsurface Soil on the Site of Building 3505 at Oak Ridge National Laboratory*. ORNL/TM-8479, (1982).
- Arthur III, W.J., "Radionuclide concentrations in vegetation at a solid radioactive waste-disposal area in southeastern Idaho," *J. Environ. Qual.*, Vol. 11, 394-399, (Jul 1982).
- Arthur III, W.J. and O.D. Markham, "Small mammal soil burrowing as a radionuclide transport vector at a radioactive waste disposal area in southeastern Idaho," *J. Environ. Qual.*, Vol. 12, 117-122, (Jan 1983).
- Arthur III, W.J. and D.H. Janke, "Radionuclide concentrations in wildlife occurring at a solid radioactive waste disposal area," *Northwest Sci.*, Vol. 60, 154-165, (1986).
- Arthur, W.J., O.D. Markham, C.R. Groves and B.L. Keller, "Radionuclide export by deer mice at a solid radioactive waste disposal area in Southeastern Idaho, USA," *Health Phys*, Vol. 52, 45-54, (1987).
- Auerbach, S.I., *Comparative Behavior of Three Long-Lived Radionuclides in Forest Ecosystems*, AC05-84OR21400, (1986).

Australian Atomic Energy Commission, *Radionuclide Migration around Uranium Ore Bodies – Analogue of Radioactive Waste Repositories. Annual Report 1984-1985*, AAEC/C55, (November 1986).

Auxier, J.A. and T.W. Oakes, *Industrial Safety and Applied Health Physics Division Annual Report for 1981*, ORNL-5859, (Aug 1982).

Baxter, M.S. and S.R. Aston, "Deep ocean radioactive waste disposal an evaluation of the seaweed critical pathway," *Health Phys*, Vol. 45, 139-144, (1983).

Bettencourt, A.O., M.M. Bordalo Costa, F.P. Carvalho, G. Ferrador and G. Alberto, "Measurement of Long-Lived Radionuclides in the Atlantic Related to Radioactive Wastes Deep-Sea Disposal," *Behaviour of Long-Lived Radionuclides Associated with Deep-Sea Disposal of Radioactive Wastes. Report of a Co-Ordinated Research Programme 1982-1984*, IAEA-TECDOC-368, (Apr 1986).

Bettencourt, A.O., M.D.T. Elias and G.C. Ferrador, "Marine Environmental Monitoring Related to Sea Disposal of Radioactive Waste in the NE Atlantic Ocean," *Proceedings of the 2nd. General Congress of Nuclear Energy. Vol. 3* INIS-BR-1147-Vol.3, (1988).

Bidoglio, G. and A. Avogadro, "Equilibrium and kinetic controls on the subsurface migration of radioactive contaminants," *Geoderma*, Vol. 44, 203-209, (1989).

Birchard, G.F., "International Alligator Rivers Analog Project," *Radioact. Waste Manage. Nucl. Fuel Cycle*, Vol. 13, 325-337, (1989).

Blanchard, R.L., D.M. Montgomery, H.E. Kolde and G.L. Gels, *Supplementary Radiological Measurements at the Maxey Flats Radioactive Waste Burial Site, 1976-1977*, EPA/520/5-78-011, (Sep 1978).

Bondietti, E.A. and F.H. Sweeton, *Transuranic Speciation in the Environment*, NVO-178, (1977).

Bondietti, E.A. and J.R. Trabalka, "Evidence for plutonium(V) in an alkaline, freshwater pond," *Radiochem. Radioanal. Lett*, Vol. 42, 169-76, (1980).

Bondietti, E.A., "Mobile Species of Pu, Am, Cm, Np and Tc in the Environment," *Environmental Migration of Long-Lived Radionuclides. Proceedings of an International Symposium on Migration in the Terrestrial Environment of Long-Lived Radionuclides from the Nuclear Fuel Cycle Organized by the IAEA, the CEC and the OECD NEA and held in Knoxville, USA, 27-31 July 1981*, (1982), pp. 81-96.

- Bowen, V.T. and H.D. Livingston, *Radionuclide Distributions in Sediments of Marine Areas Used for Dumping Solidified Radioactive Wastes*, COO-3563-62, (1976).
- Bowen, V.T. and H.D. Livingston, "Radionuclide Distributions in Sediment Cores Retrieved from Marine Radioactive Waste Dump Sites." *Impacts of Radionuclide Releases into the Marine Environment. Proc. Symp. Vienna*, 1980. IAEA-SM-248/151, (1981).
- Bulman, R.A., *Concentration of Actinides in the Food Chain*, NRPB-R44, (1976).
- Cleveland, J.M. and T.F. Rees, "Investigation of solubilization of Plutonium and Americium in soil by natural humic compounds," *Environ Sci Technol*, Vol. 10, 802-806, (1976).
- Cleveland, J.M., T.F. Rees and K.L. Nash, *Chemical speciation of plutonium in selected ground waters. March 28-April 2, 1982*, Vol. 83, (1982), pp. NUCL-41.
- Colombo, P. and A.J. Weiss, *Evaluation of Isotope Migration, Land Burial. Water Chemistry at Commercially Operated Low-Level Radioactive Waste Disposal Sites. Progress Report No. 10, July-September 1978*, BNL-NUREG-51083, (Sep 1979).
- Czycinski, K.S., R.F. Pietrzak and A.J. Weiss, *Evaluation of Isotope Migration: Land Burial. Quarterly Progress Report, October-December 1980*, BNL-NUREG-51383, (Apr 1981).
- Czycinski, K.S., R.F. Pietrzak and A.J. Weiss, *Evaluation of Isotope Migration - Land Burial. Volume 1. Quarterly Progress Report, January-March 1981*, BNL-NUREG-51409-Vol.1, (Jun 1981).
- Dana, R.H.J., V.S. Ragan, S.A. Molello, H.H. Bailey and R.H. Fickies, *General Investigation of Radionuclide Retention In Migration Pathways at The West Valley, New York Low-Level Burial Site. Final Report 1 Oct 78-14 Feb 80*, NUREG/CR-1565, (Oct 1980).
- Denham D. H., "Environmental radiological surveillance in perspective—the relative importance of environmental media as a function of effluent pathway and radionuclides," *Health Phys*, Vol. 36, 273-282, (1979).
- Dickson, R.L., *Radiation Exposure Rates and Radionuclide Concentrations in Soil around the Argonne National Laboratory-West Site*. DOE/ID-12106, (Mar 1986).
- Dyer, R.S., "Environmental Surveys of Two Deep Sea Radioactive Waste Disposal Sites Using Submersibles," *Management of Radioactive Wastes from the Nuclear Fuel Cycle*, Proceedings Symposium, International Atomic Energy Agency, Vienna, Austria, (1976), pp. 317-338.

- Edgington, D., "The Behaviour of Transuranics in Natural Waters, *Transuranic Cycling Behaviour in the Marine Environment. Final Report of the Co-Ordinated Research Programme Sponsored by the International Atomic Energy Agency from 1979 to 1981*, IAEA, Vienna, Austria, IAEA-TECDOC-265, (1982).
- Emery, R.M., D.C. Klopfer, D.A. Baker and J.K. Soldat, *Potential Radiation Dose from Eating Fish Exposed to Actinide Contamination*, PNL-SA-8285, (1980).
- Essington, E.H., E.B. Fowler and W.L. Polzer, *Retention of Low-Level Radioactive Waste Material by Soil*. LA-UR-79-322, (1979).
- Feldt, W., G. Kanisch, M. Kanisch and M. Vobach, "Radioecological studies of sites in the Northeast Atlantic used for dumping of low-level radioactive wastes - Results of the research cruises of FRV "Walther Herwig" 1980-1984," *Arch. Fisch Wiss.*, Vol. 35, 91-195, (1985).
- Feldt, W., G. Kanisch and M. Vobach, "Deep-Sea Biota of the Northeast Atlantic and their Radioactivity," *Interim Oceanographic Description of the North East Atlantic Site for the Disposal of Low-Level Radioactive Waste F.*, F. Nyffeler and W. Simmons, Eds., NEA/OECD, Paris Vol. 3, (1989).
- Fisher, N.S. and S.W. Fowler, "Oceanic processes in marine pollution, Volume 2," *The Role of Biogenic Debris in the Vertical Transport of Transuranic Wastes in the Sea*. T.P. O'Conner, W.V. Burt and I.W. Duedall, Eds., (1987), pp. Chapter 16.
- Flynn, K.F., A.L. Justus, C.M. Sholeen, W.H. Smith and R.A. Wynveen, *Post-Remedial-Action Radiological Survey Report for the Plutonium Facility of the Battelle Memorial Institute, Columbus Division, West Jefferson Complex, West Jefferson, Ohio, April 1980-June 1982*. ANL-OHS/HP-85-103, (Jan 1987).
- Fowler, E.B. and E.H. Essington, "Soils Element Activities. October 1972-September 1973," *The Dynamics of Plutonium in Desert Environments. Nevada Applied Ecology Group Progress Report as of January 1974.*, P.B. Dunaway and M.G. White, Eds., NVO-142, (1974).
- Fowler, E.B. and W.L. Polzer, Los Alamos, NM, USA, *Review of Research Conducted by Los Alamos National Laboratory for the NRC (National Regulatory Commission) with Emphasis on the Maxey Flats, Kentucky, Shallow Land Burial Site*. LA-11354-MS, (1988).
- Fried, S., A.M. Friedman, J. Hines, G. Schmitz and M. Wheeler, "Distribution of Plutonium and Americium at a Former Los Alamos Waste Disposal Site, Transuranics," In *Natural Environments*. NVO-178, (1976).
- Fried, S., A.M. Friedman, J.J. Hines, R.W. Atcher and L.A. Quarterman, *Migration of Plutonium and Americium in the Lithosphere*. CONF-7604126-1, (1976).

- Fried, S., "Retention of Plutonium and Americium by Rock," *Science*, Vol. 196, 1087-, (June 1977).
- Friedman, A.M., *Actinides in the Environment*, (1976)
- Grenthe, I. and D. Ferri, "Actinide Species in Groundwater Systems," *Proc. Workshop Near-Field Phenom. Geol. Repos. Radioact. Waste.*, (1981), pp. 21-32.
- Hakonson, T.E. and K.W. Bostick, "The availability of environmental radioactivity to honey bee colonies at Los Alamos California USA," *J Environ Qual*, Vol. 5, 307-310, (1976).
- Hakonson, T.E. and K.V. Bostick, "Cesium-137 and plutonium in liquid waste discharge areas at Los Alamos," *Spec. Publ. - Ecol. Soc. Am*, Vol. 1 (Radioecol. Energy Resour), 40-48, (1976).
- Hakonson, T.E., J.W. Nyhan and W.D. Purtymun, "Accumulation and Transport of Soil Plutonium in Liquid Waste Discharge Areas at Los Alamos," *Transuranium Nuclides in the Environment.*, (1976), pp. 175-189.
- Hakonson, T.E. and A.F. Gallegos, "Radionuclide Uptake by Vegetable Crops in the Mortandad Canyon Garden Plot During 1976 (^{137}Cs , ^{238}Pu , ^{239}Pu , radishes, tomatoes)," *Biomedical and Environmental Research Program of the LASL Health Division. Progress Report, January-December 1977. LA-7254-PR*, (Oct 1978).
- Hakonson, T.E. and J.W. Nyhan, "Comparative Distribution of Plutonium in Los Alamos and Trinity Ecosystems," *Biomedical and Environmental Research Program of the LASL Health Division. Progress Report, January-December 1977. D.F. Petersen and E.M. Sullivan, (comps.), LA-7254-PR*, (Oct 1978).
- Halford, D.K., J.B. Millard and R.G. Schreckhise, Idaho National Engineering Lab., Idaho Falls, "Retention of Activation and Fission Radionuclides by Mallards from the Test Reactor Area Radioactive Leaching Pond," *Ecological Studies on the Idaho National Engineering Laboratory Site. 1978 Progress Report. O.D. Markham, Ed., IDO-12087*, (Dec 1978).
- Halford, D.K., "Density, Movement, and Transuranic Tissue Inventory of Small Mammals at A Liquid-Radioactive Waste Disposal Area," *Environmental Research on Actinide Elements. J.E. Pinder III, J.J. Alberts, K.W. McLeod and R.G. Schreskhise, Eds., CONF-841142*, (1987).
- Hardy, C.J., "Research on Uranium Deposits as Analogues of Radioactive Waste Repositories," *Proceedings of the Sixth Pacific Basin Nuclear Conference. The Outlook of Nuclear Technology Development in the 1990's. Lu Rongguang, Ed., CNIC-I-002*, (1987).

- Harper, J. and R. Garde, "The decommissioning of a plutonium-239 contaminated facility and an actinium-227 contaminated facility at the Los Alamos National Laboratory California USA," *Health Phys*, Vol. 43, 141-142, (1982).
- Hoffman, E.L. and J. Arthur, *Environmental Survey at Lucas Heights Research Laboratories*, 1989, ANSTO-E-694, (Sep 1990).
- Holcomb, H.P., "Radionuclide Content of an Exhumed Canyon Tank and Neighboring Soil," *Management of Low-Level Radioactive Waste. Volume II*. M.W. Carter, A.A. Moghissi and B. Kahn, Eds., (1979), pp. 1149-1160.
- Hooker, R.L. and R.W.J. Root, *Lysimeter Tests of Srp Waste Forms*. DP-1591, (May 1981).
- Johansson, L., *Oral Intake of Radionuclides in the Population. A Review of Biological Factors of Relevance for Assessment of Absorbed Dose at Long Term Waste Storage*, FOA-C-40161-W4, (Nov 1982).
- Kershaw, P.J., R.J. Pentreath, R.R. Dickson and M.B. Lovett, "Cesium and Transuranium Radionuclides in Seawater, Sediments and Biota, on and around the NEA Dumpsite," *Interim Oceanographic Description of the North East Atlantic Site for the Disposal of Low-Level Radioactive Waste*. F. Nyffeler and W. Simmons, Eds., NEA/OCED, Paris, Vol 3, (1989).
- Kirby, L.J., *Radionuclide Distributions and Migration Mechanisms at Shallow Land Burial Sites - Annual Report of Research Investigations on the Distribution, Migration and Containment of Radionuclides at Maxey Flats, Kentucky*. (Rept. for Jul 80-Jul 81), PNL-4067, (Jul 1982).
- Kirby, L.J., A.P. Toste and C.L. Wilkerson, "Chemical Species of Migrating Radionuclides at A Shallow Land Low-Level Radioactive Waste Burial Site," *Environmental Migration of Long-Lived Radionuclides*, (1982), pp. 63-69.
- Kirby, L.J. and A.P. Toste, "Chemical Characteristics, Migration and Fate of Radionuclides at Commercial Shallow Land Burial Sites," *Proceedings of the Fifth Annual Participants' Information Meeting: DOE Low-Level Waste Management Program*, CONF-8308106, (1983).
- Knobel, L.L. and L.J. Mann, *Radionuclides in Ground Water at the Idaho National Engineering Laboratory, Idaho*, DOE/ID--22077, (Dec 1988).
- Kuzo, G.B., L.J. Fraley and O.D. Markham, "Transuranic Concentrations in Selected Biotic and Abiotic Components of the Idaho National Engineering Laboratory Test Reactor Area Ponds," *Ecological Studies on the Idaho National Engineering Laboratory Site. 1978 Progress Report*., O.D. Markham, Ed., IDO-12087, (Dec 1978).

- Landeem, D.S. and R.M. Mitchell, "Radionuclide uptake by trees at a radwaste pond in Washington State," *Health Phys.*, Vol. 6, 769-774, (Jun 1986).
- Mahara, Y., "Migration of Fallout Radionuclides in the Unsaturated Silty Loam Layer of Nishiyama in Nagasaki," *Denryoku Chuo Kenkyusho Hokoku*, (Feb 1984), pp. 1-26.
- Markham, O.D., 1975 *Progress Report: Idaho National Engineering Laboratory Site Radioecology-Ecology Programs*, IDO-12080, (Jun 1976).
- Markham, O.D., K.W. Puphal and T.D. Filer, "Plutonium and americium contamination near a transuranic storage area in southeastern Idaho," *J. Environ. Qual.*, Vol. 7, 422-428, (1978).
- Markham, O.D., D.K. Halford, S.K. Rope and G.B. Kuzo, "Plutonium, Am, Cm and Sr in ducks maintained on radioactive leaching ponds in southeastern Idaho," *Health Phys.*, Vol. 55, 517-524, (Sep 1988).
- Matuszek, J.M., "Biochemical and chemical processes leading to radionuclide transport from low-level waste burial sites," *Trans. Am. Nucl. Soc.*, Vol. 34, 155-156, (1980).
- Mayfield, D. and W.R. Hansen, *Surface Reconnaissance through 1980 for Radioactivity at Radioactive Waste Disposal Area G at the Los Alamos National Laboratory*, LA-9656-MS, (Mar 1983).
- McFadden, K.M., *Organic Components of Nuclear Wastes and Their Potential for Altering Radionuclide Distribution when Released to Soil*, PNL-2563, (Aug 1980).
- McIntyre, P.F., 1987 *Monitoring Report for the Defense Waste Lysimeters*, DPST-87-568, (10 Aug 1987).
- McIntyre, P.F. and R.H. Hawkins, *Radionuclide Uptake by Pinetrees Growing on Lysimeters*, DPST-88-910, (31 Oct 1988).
- McLaughlin, T.J., K.H. Cramer, D.A. Lamar, D.R. Sherwood, R.D. Stenner and W.B. Schulze, "Assessment of Mixed Hazardous and Radioactive Waste Sites at Hanford," *Proceedings of the ninth annual DOE low-level waste management forum: Technical session 4, Waste characterization and verification*, CONF-870859-Pt.4, (Feb 1988).
- McNair, V.M., R.C. Aldrich, G.R. Cox, M.H. Litzinger, G.G. Meade and G.J. Sliger, *Rockwell Hanford Operations Effluents and Solid Waste Burials During CY 1982*, RHO-HS-SR-82-1P, (Jun 1983).

- Meadows, S. and J. Salazar, "Investigation of Radionuclide Concentrations in Tissues of Elk Utilizing Los Alamos National Laboratory Lands," *Los Alamos Life Sciences Division's Biomedical and Environmental Research Programs. Progress Report, January-December 1981*. L.M. Holland and C.G. Stafford, (comps), LA-9479-PR, (Oct 1982).
- Means, J.L., D.A. Crerar, M.P. Borcsik and J.O. Duguid, "Radionuclide adsorption by manganese oxides and implications for radioactive waste disposal," *Nature*, Vol. 274, 44-47, (6 Jul 1978).
- Means, J.L., D.A. Crerar, M.P. Borcsik and J.O. Duguid, "Adsorption of Co and selected actinides by Mn and Fe oxides in soils and sediments," *Geochim. Cosmochim. Acta*, Vol. 42, 1763-1773, (Dec 1978).
- Mullen, A.A. and R.E. Mosley, *Availability, Uptake and Translocation of Plutonium Within Biological Systems: A Review of the Significant Literature*, PB-252179, (1976).
- Nies, H., "Plutonium and ^{137}Cs in the Water Column of the Northeast Atlantic," *Interim Oceanographic Description of the North-East Atlantic Site for the Disposal of Low-Level Radioactive Waste*, Vol 3, (1989).
- Noshkin, V.E., K.M. Wong, T.A. Jokela, R.J. Eagle and J.L. Brunk, *Radionuclides in the marine environment near the Farallon Islands (^{238}Pu , ^{239}Pu , ^{240}Pu , ^{137}Cs)*, UCRL-52381, (6 Jan 1978).
- Noshkin, V.E., K.M. Wong and R.J. Eagle, *Radionuclides in Sediments from the Northeast Atlantic Disposal Site*, UCID-19924, (Nov 1983).
- Noshkin, V.E., *Plutonium in Northeast Atlantic Sediments. 2nd Interim Oceanographic Description of the North East Atlantic Site for the Disposal of Low-level Radioactive Waste*, UCRL-91669, (October 1984).
- Noshkin, V.E., "Plutonium in North East Atlantic Sediments," *Interim Oceanographic Description of the North-East Atlantic Site for the Disposal of Low-Level Radioactive Waste*. R.R. Dickson, P.A. Gurbutt and P.J. Kershaw, Eds., NEA/OECD, Paris, Vol. 2, (1986).
- Organization for Economic Co-Operation and Development, *Review of the Continued Suitability of the Dumping Site for Radioactive Waste in the North-East Atlantic*. NEA/OECD, Paris, (1985).
- Papucci, C. and R. Delfanti, "Distributions of $^{239,240}\text{Pu}$ and ^{14}C in North-East Atlantic Sediments (Waste Disposal and NOAMP Areas)," *Radionuclides: A Tool for Oceanography*. J.C. Guary, P. Guegueniat and R.J. Pentreath, Eds., (1988).

- Papucci, C. and R. Delfanti, " ^{14}C and $^{239,240}\text{Pu}$ as Tracers of Sedimentation and Mixing Processes in North-East Atlantic Sediments," *Interim Oceanographic Description of the North-East Atlantic Site for the Disposal of Low-Level Radioactive Waste*. F. Nyffeler and W. Simmons, Eds., (1989), Vol. 3, pp. 111–122.
- Polzer, W.L., E.H. Essington and E.B. Fowler, "A Mechanism for Transport of Plutonium through Soil at the Maxey Flats, Ky., Shallow Land Burial Site," *Transactions, American Nuclear Society 1982 Winter Meeting, November 14–18, 1982*, (1982).
- Purtymun, W.D., R. Peters and M.N. Maes, *Transport of Plutonium in Snowmelt Run-Off*, LA-11795-MS, (Jul 1990).
- Rai, D., R.G. Strickert and J.L. Swanson, *Actinide Solubilities in the Near-Field of A Nuclear Waste Repository*, (1981), pp. 13–20.
- Rees, T.F. and J.M. Cleveland, "Characterization of Plutonium in Waters at Maxey Flats, Kentucky, and Near the Idaho Chemical Processing Plant, Idaho," *Environmental Migration of Long-Lived Radionuclides. Proceedings of a Symposium Knoxville, 27–31 July 1981*, (1982), pp. 41–52.
- Roberts, F.P., *Assessment of Radiation Effects in Defense Transuranic Waste Forms*, PNL-3913, (Jul 1981).
- Roberts, J.M., "Mobility of plutonium and americium through a shallow aquifer in a semiarid region," *Chemtracts: Anal., Phys., Inorg. Chem*, Vol. 2, 426–428, (1990).
- Robison, W.L. and V.E. Noshkin, *Analysis of Core Soil and Water Samples From the Cactus Crater Disposal Site at Enewetak Atoll*, UCID-18935, (Feb 1981).
- Rundberg, R.S., *Assessment Report on the Kinetics of Radionuclide Adsorption on Yucca Mountain Tuff*, LA-11026-MS, (Jul 1987).
- Schell, W.R. and S. Sugai, *Radionuclides in Water, Sediment and Biological Samples Collected in August–October 1977 at the Radioactive Waste Disposal Site Near the Farallon Islands*, (1978).
- Schell, W.R. and S. Sugai, "Radionuclides at the U.S. radioactive waste disposal site near the Farallon Islands," *Health Phys.*, Vol. 39, 475–496, (Sep 1980).
- Schell, W.R. and A.E. Nevissi, "Radionuclides at the Hudson Canyon Disposal Site," *Radioactive Wastes and the Ocean*. I.W. Duedall, B.H. Ketchum, P.K. Park and D.R. Kest, Eds., (1983), pp. 183–214.

- Schweingruber, M.R., "Evaluation of solubility and speciation of actinides in natural groundwaters," *Mater. Res. Soc. Symp. Proc.*, Vol. 11, (Sci. Basis Nucl. Waste Manage. 5), 679-88, (1982).
- Sehmel, G.A., "Transuranic Resuspension," *Environmental Research on Actinide Elements*. J.E. Pinder III, J.J. Alberts, K.W. McLeod and R.G. Schreskhise, Eds., CONF-841142, (1987).
- Senoo, M., K. Shirahashi, Y. Sakamoto, N. Moriyama and M. Konishi, "Research on Safety Evaluation for TRU Waste Disposal," *Low and Intermediate Level Radioactive Waste Management*. F. Feizollahi, R. Kohout and A. Suzuki, Eds., (1989.), pp. 483-490.
- Smith, J.N., B.P. Boudreau and V. Noshkin, "Plutonium and ^{210}Pb distributions in northeast Atlantic sediments: Subsurface anomalies caused by non-local mixing," *Earth & Planetary Science Letters* , Vol. 81, 15-28, (1986/87).
- Smith, J.N., V.E. Noshkin and B.P. Boudreau, "Non-Local Mixing in Deep-Sea Sediments," *Interim Oceanographic Description of the North-East Atlantic Site for the Disposal of Low-Level Radioactive Waste*. F. Nyffeler and W. Simmons, Eds., NAE/OECD, Paris, Vol. 3, (1989).
- Stone, J.A., J.W. Fenimore, R.H. Hawkins, S.B. Oblath and J.P. Ryan Jr., *Shallow Land Burial of Solid Low-Level Radioactive Wastes - 30 Years of Experience at the Savannah River Plant*, DP-MS-82-61, (1983).
- Subrahmanyam, V.B., *Transuranic Measurements for In Situ Vitrification*, RHO-RE-SA-191-P, (May 1987).
- Swanson, J.L., "Organic Complexant-Enhanced Mobility of Toxic Elements in Low-Level Wastes," *Proceedings of the Sixth Annual Participants' Information Meeting Doe Low-Level Waste Management Program*, CONF-8409115, (1984).
- Swanson, J.L., *Organic Complexant-Enhanced Mobility of Toxic Elements in Low-Level Wastes. Final Report*, PNL-4965-10, (Jul 1986).
- Talmage, S.S. and B.D. Chilton, *Cleanup Procedures at the Nevada Test Site and at Other Radioactively Contaminated Sites Including Representative Costs of Cleanup and Treatment of Contaminated Areas*, ORNL-6317, (1987).
- Toste, A.P., L.J. Kirby and T.R. Pahl, "Role of Organics in the Subsurface Migration of Radionuclides in Groundwater," *ACS Symp. Ser.*, Vol. 246 (Geochemical Behavior of Disposed Radioactive Waste), 251-270, (1984).

Vangenechten, J.H.D., S.R. Aston and S.W. Fowler, "Uptake of Americium -241 from two experimentally labeled deep sea sediments by 3 benthic species a bivalve mollusk, a polychaete and an isopod," *Mar Ecol Prog Ser* , Vol. 13, 219-228, (1983).

Whelan, G., F.L. Thompson and S.B. Yabusaki, *Multimedia Contaminant Environmental Exposure Assessment Methodology as Applied to Los Alamos, New Mexico*, PNL-4546, (1983).

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