



Glossary^(a)

100 Areas	site of the Hanford production ^(a) reactors, which include B, C, D, DR, F, H, KE, KW, and N Reactors (see Figure 1 in the Site Characterization Section for the reactor areas)
200 Areas	sites of the Hanford chemical separations plants, which include the bismuth phosphate process plants (B and T Plants), plutonium uranium extraction plant (A Plant/PUREX), and reduction and oxidation plants (S Plant/REDOX)
300 Area	site of the research, development, and fuel-fabrication operations (see Figure 1 in the “Site Characterization” section)
400 Area	site of the Fast Flux Test Facility (see Figure 1 in the “Site Characterization” section)
600 Area	all land within the Hanford Site not occupied by the 100, 200, 300, 400, 1100, or 3000 Areas
1100 Area	site of the warehouse, vehicle maintenance, and transportation operations center (see Figure 1 in the “Site Characterization” section)
3000 Area	site of engineering, construction, and research and development activities (see Figure 1 in the “Site Characterization” section)
abiotic	neither living material nor derived from living material
aCi	attocurie, one quadrillionth of a curie or 10^{-18}
alpha particle	a positively charged particle emitted from the nucleus of an atom; consists of two protons and two neutrons. The alpha particle is identical to a helium nucleus.
analytes	substances for which an analysis is made
anthropogenic	created by humans
aquatic ecosystem	ecological system containing species that live in water

(a) The terms in this glossary are defined as they are used in this report. Therefore, not all of the possible definitions are provided—unless the term is used in multiple ways.



BAC	bioaccumulation factor
background level	measured level at which the concentration of a substance is consistently present in the environment (see “reference level”)
BCF	bioconcentration factor
beta particle	electron emitted from a radioactive nucleus
bioaccumulation factor	ratio of the body burden of an aquatic species to the water concentration when all potential uptake mechanisms are included
bioconcentration factor	ratio of the body burden of an aquatic species to the water concentration where uptake is limited to water alone
biomagnification factor	ratio of the body burden in a species to the average body burden of its prey
biomagnifying	having a tendency to increase in concentration at higher food chain levels through dietary accumulation
biota	living organisms
biotic	referring to living organisms and their products
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (42 USC 9601 et seq. as amended)
cfs	cubic feet per second
chemicals (carcinogenic)	chemicals with a cancer causing or promoting agent
chemicals (toxic)	noncarcinogenic chemicals with a poisonous agent
Ci	curie, see definition under “curie”
concentration	amount of substance in a given quantity of material (for example, micrograms of chromium per liter of groundwater)
concentration factors	the ratio of the reported body burden to that of the organism’s food, or to the water concentration in the case of fish (also termed “transfer factor”)



conceptual model	conceptual representation of a process or entity generalized from particular instances
coulomb	unit of electric charge; amount of electric charge that crosses a surface in 1 second when a steady current of 1 absolute ampere is flowing across the surface
CPOM	coarse particulate organic matter
CRCIA	Columbia River Comprehensive Impact Assessment
CRCIA Team	Columbia River Comprehensive Impact Assessment Management Team
curie	unit of radioactivity corresponding to 3.7×10^{10} (37 billion) disintegrations per second (abbreviated Ci), 1 curie = 3.7×10^{10} Becquerel
data files	electronic files of data for use in the screening assessment
final data file	final sets of data with substituted data included for use in the screening assessment
media files	data organized by media and prepared for use in the screening assessment prior to inclusion of substituted data
raw data files	unprepared data gathered for use in the screening assessment
deterministic analysis	single calculation performed with a single value selected for each parameter, such as a concentration value of a contaminant entering the river; in contrast, see stochastic analysis
deterministic value	single value used in a calculation; for example, 20 miles per gallon is used to estimate the fuel efficiency of a car; actual gas mileage varies considerably but averages to be this value so it is the one used in calculations
disposal plan	official document formally approving a specific closure or disposal method for Hanford materials and contaminants; each cleanup project will have a different disposal plan
DOE	U.S. Department of Energy



dose	amount of radiation; often distinguished as absorbed dose, dose equivalent, or effective dose equivalent
absorbed dose	amount of energy deposited by radiation in a given amount of material, such as tissue; expressed in units of rad or gray (1 gray = 100 rad)
dose equivalent	quantity calculated to compare relative biological effectiveness of different kinds of radiation, using a common numerical scale; determined by multiplying absorbed dose by a quality factor and other modifying factors; expressed in units of rem/mrem (a millirem is one-thousandth of a rem) or sievert (1 sievert = 100 rem)
effective dose equivalent	value used to account for the fact that a rem of radiation to one organ in the body does not have the same potential health impact as a rem of dose to another organ; it is the sum of the dose to all organs of the body from internal deposition of radionuclides and the dose from external radiation exposure; expressed in units of rem or sievert (1 sievert = 100 rem)
drive point	method used to place a sampling tube in sediment (pointed tip driven into sediment)
Ecology	Washington State Department of Ecology
EHQ	environmental hazard quotient, defined as estimated exposure divided by exposure producing a toxicological response at a measurement endpoint
EIS	environmental impact statement
endangered species	species which is in danger of extinction throughout all or a significant portion of its range
endpoints	biological resources and attributes that are to be protected and maintained within ecosystems potentially at risk
assessment endpoints	attributes of interest for the species; an explicit expression of the environmental value that is to be protected; an assessment endpoint includes both an ecological entity and specific attributes of that entity; for example, salmon are a valued ecological entity; reproduction and population maintenance of salmon form an assessment endpoint (EPA 1996)



measurement endpoint values	toxicological response used to represent the assessment endpoint; a measurable ecological characteristic that is related to the valued characteristic chosen as the assessment endpoint (EPA 1996)
EPA	U.S. Environmental Protection Agency
ERC	Environmental Restoration Contractor (Bechtel Hanford, Inc.; CH2M Hill Hanford, Inc.; IT Hanford, Inc.; Thermo Hanford, Inc.)
exposure	process by which the temporally and spatially distributed concentrations of a chemical or radionuclide in the environment result in a dose
internal exposure	contact with materials taken into the body through inhalation or ingestion
external exposure	contact with materials on the outside of the body, as from submersion in water or immersion in air
extrapolation	the inference of data from an observed region to an unobserved region, used to fill data gaps with substitute data from the same medium but from a different location
fission	nuclear reaction in which the nucleus of an atom breaks up into two or more nuclei and releases energy (radiation)
food web	network of foraging relationships among species in a community
foraging guild	broad group of organisms that have a similar dietary composition; examples include carnivore and omnivore
gamma ray	electromagnetic radiation emitted from the nucleus when an atom is in transition from a higher to a lower energy state
Geographic Information System	computerized system designed to efficiently capture, store, update, manipulate, analyze, and display all forms of geographically referenced information
geometric standard deviation	the exponentiation standard deviation of the log-transformed median values
grab sample	sample randomly collected from a single location at a specific time



gross beta	total beta activity of beta-emitting radionuclides that cannot be distinguished separately by instrumentation or radiochemical analyses
GW	groundwater
half-life	time required for an initial number of radioactive atoms to be reduced to half that number by radioactive decay
Hanford Reach	segment of the Columbia River that extends 85 kilometers (51 miles) downstream from Priest Rapids Dam to the head of the McNary Pool near the City of Richland, Washington
hazard index	the ratio between the reference dose determined by the EPA to be safe and the dose that has been estimated
hazard ranking	semi-quantitative listing in order of potential hazard
HEAST	Health Effects Assessment Summary Tables, a compilation of toxicity values published in health effects documents issued by the EPA
HEIS	Hanford Environmental Information System; an electronic database that consolidates the data gathered during environmental monitoring and restoration of the Hanford Site
Henry's Law	air/water partition coefficient at low concentrations of a chemical in water; it relates the chemical concentration in the gas phase to its concentration in the water phase
herbivore	organism that feeds on plants
holdup time	length of time a parent radionuclide spends in the reactor core, usually expressed in seconds; also length of time between harvest and consumption of food products
HSRAM	Hanford Site Risk Assessment Methodology (DOE 1995)
HUMAN	computer code used to estimate risk to human health
Interim Remedial Measures	corrective actions taken at Hanford Site operable units under CERCLA or RCRA at any time prior to initiation of final remedial actions; examples are pumping and treating contaminated groundwater, excavating contaminated soil, restricting access to contamination via warning signs and fences



ionizing radiation	high-energy radiation capable of ionizing the substances through which it passes
IRIS	Integrated Risk Information System; an EPA database that provides data on chronic health hazards (reference dose values), carcinogenicity (unit risk factors or slope factors), EPA regulatory actions, supplementary data, and a bibliography for each listed chemical
irradiation	exposure of an object to radiation
isopleth	line drawn through points on a graph at which a given quantity has the same numerical value or occurs with the same frequency as a function of the two coordinate variables
isotope	one of two or more atoms having the same atomic number but different mass
Kcal	kilocalorie
LC₅₀	chemical concentration reported to be lethal to 50 percent of the exposed organisms after some period of exposure, usually a few hours to a few days
LD₅₀	dose reported to be lethal to 50 percent of the exposed organisms after some period of exposure, usually a few hours to a few days
LFI	limited field investigation conducted as part of Tri-Party Agreement activities to identify those Hanford waste sites that are recommended to remain as candidates for interim remedial measures
LOEC	lowest observed effects concentration
LOEL	lowest observed effects level
lognormal distribution	data distribution where the logarithms of the data form a normal distribution
maximum representative value	highest concentration value that is considered representative of the sampling location
mean (arithmetic)	average value of a set of numbers



mean (geometric)	the exponentiation of the average value of a set of log-transformed data
median	middle value in a series of values arranged in order of size
MEPAS	Multimedia Environmental Pollutant Assessment System; a computer code that can be used to estimate the transport and fate of environmental pollutants
model	representation of a process or entity; the representation may be graphical or a set of mathematical equations that simulate the process or entity being modeled; see also conceptual model
monitor species	Washington State Department of Fish and Wildlife classification for species that either 1) were at one time classified as endangered, threatened, or sensitive; 2) require habitat that has limited availability during some portion of the species' life cycle; 3) are indicators of environmental quality; 4) require further field investigations to determine population status; 5) have unresolved taxonomic issues which may bear upon their status classification; 6) may be competing with and impacting other species of concern; or 7) have significant popular appeal
mrad	millirad, one-thousandth of a rad
mrem	millirem, one-thousandth of a rem
natural uranium	naturally occurring mixture of uranium (0.7 percent uranium-235 and 99.3 percent uranium-238)
nCi	nanocurie, one billionth of a curie or 10^{-9}
NEPA	National Environmental Policy Act of 1969 (42 USC 4321 et seq. as amended)
neutron	an uncharged particle that has approximately the same mass as the proton and is a constituent of all nuclei having a mass number greater than one
non-biomagnifying	remaining at the same concentration or decreasing in concentration at higher levels in the food chain
NPDES	National Pollution Discharge Elimination System



NPL	National Priorities List
omnivore	organism that feeds on both plants and animals
operable unit	term used to identify specific areas designated for cleanup
order of magnitude	multiplying factor of 10, term used to describe relative size; for example, two orders of magnitude is equal to two orders of 10 or 100
ORDOE	Oregon State Department of Energy
outlier	data value determined to be outside the range of likely values in the given distribution
PCB	polychlorinated biphenyl
pCi	picocurie, one-trillionth of a curie or 10^{-12}
pdf	see probability density function
piscivore	organism that feeds on fish
plume	volume of air, soil, or water containing contaminants released from a contaminant source
PNNL	Pacific Northwest National Laboratory
pore water	water in the interstitial spaces of the substrate that forms the bottom of the Columbia River; for example, groundwater in springs between rocks
ppb	parts per billion
predator (fish)	
first-order	fish that consume primarily herbivorous species; includes perch, crappie, punkinseed, and bluegill
second-order	fish that consume other fish-eating species; includes bass, trout, and squawfish
probability density function	set of all possible values of a parameter and their associated likelihoods



production operations	activities connected with the production reactors in the 100 Areas (B, C, D, DR, F, H, KE, KW, or N reactors) in which uranium or other fuel was irradiated with neutrons to produce radioactive materials; used primarily at Hanford to produce plutonium for weapons; used also for research
proton	positively charged particle which, in conjunction with the neutron, forms all atomic nuclei
punch point	seep well, which is an open-end pipe driven into the river bank
rad	radiation absorbed dose, unit of radiation absorbed dose; the amount of energy absorbed by tissues; equal to 100 ergs/grams
radioactivity	spontaneous emission of radiation (alpha, beta, gamma rays, and/or neutrons) by some nuclides as they transform into other nuclides
radionuclide	radioactive isotope of an element
RCRA	Resource Conservation and Recovery Act of 1976 (42 USC 6901 et seq. as amended)
reference dose	estimate established by the EPA for specific chemicals (with uncertainty spanning perhaps an order of magnitude) of the daily exposure of the human population to a potential hazard that is likely to be without risk of deleterious effects during a lifetime
reference level	the measured level at which the concentration of a hazardous substance is consistently present in Segment 1, which is upstream of the operating areas and thus presumably out of the influence of the Hanford Site (see “background level”)
release	discharge of a substance into the environment
release factor	ratio of amount released to the amount processed
rem	roentgen equivalent man, unit of measurement of dose equivalence; the amount of any type of radiation that produces the same biological effect as is obtained from an absorbed dose of 1 rad of 200 KVP (kilovolt potential xrays)
retention time	length of time effluent water was held in a retention basin before discharge to the Columbia River; normally expressed in hours



RfD	reference dose; for definition, see “reference dose”
RI/FS	remedial investigation/feasibility study
riparian ecosystem	ecological system on banks of a body of water; in this report, the banks of the Columbia River in the transition zone between the aquatic and terrestrial ecosystems within which plants are dependent on a perpetual source of water
risk	term relating to the consequences of exposure; measured for humans using either hazard index or lifetime risk
hazard index	risk from toxic chemicals, which is a ratio between the reference dose determined by EPA to be safe and the dose that has been estimated
lifetime risk	when applied to carcinogenic chemicals, the risk of cancer occurring; when applied to radionuclides, the risk of death from cancer
risk assessment	process used to estimate the severity and likelihood of harm to human health or the environment from hazardous substances, activities, and conditions
RISKS	
	computer code to implement statistical tests for comparing the estimated results of risk to human health with those estimated for an upstream and, therefore, presumably minimally contaminated location
riverine	habitat in the river, in this case the Columbia River
roentgen	unit of exposure of ionizing radiation that produces a charge of 1 coulomb of electric charge per kilogram of dry air
microroentgen	one-millionth of a roentgen
milliroentgen	one-thousandth of a roentgen
RTECS	Registry of Toxic Effects of Chemical Substances
scientific notation	used to express very large or very small numbers; for example, the number 1 billion could be written as 1,000,000,000 or using scientific notation as 1E+09 or 1×10^9 ; translating from scientific notation to a more traditional number requires moving the decimal point either left or right from the number; if the value given is 2E+03 (2.0×10^3), the



decimal point should be moved three numbers (insert zeros if no numbers are given) to the right of its present location; the number would then read 2,000; if the value given is 2E-05 (2.0×10^{-5}), the decimal point should be moved five numbers to the left of its present location; the result would become 0.00002

screen	a simple test to rapidly identify potentially critical components and exposure pathways by eliminating those of known lesser significance by applying conservative assumptions and model parameters that attempt to deliberately overestimate the risks
screening assessment of risk	risk assessment with limited scope; the limitations of the CRCIA screening assessment were that it was restricted to 1) current conditions, 2) the area between the vicinity of Priest Rapids Dam and McNary Dam, 3) a limited number of contaminants, 4) a limited amount of monitoring data, 5) a limited number of species, and 6) a limited number of scenarios
SD	sediment
seeps	discharge zones located above river water level where the flow rate is very low
segment	a section of the river over which contaminant conditions can be expected to be similar and which captures the major influences to the Columbia River
semi-aquatic ecosystem	ecological system containing those species that live partially in water and partially on land
sensitive species	species which is likely to become endangered or threatened in a significant portion of its range
sensitivity	susceptibility of an organism to adverse effects resulting from exposure to contaminants
sensitivity analysis	determination of the parameters and pathways that contribute most to the uncertainty in exposure or effects calculations
SESP	Surface Environmental Surveillance Project



sink	medium in which contaminants are deposited and from which there is little or no short-term contaminant migration (for example, sediment immediately upstream from McNary Dam)
site planning baseline	specification of a method of disposal for each waste site; where no baseline exists, the guidance of the responsible agency shall be used with regulator concurrence and CRCIA Board approval; in that case, the baseline would be the current condition
skyshine	caused by Compton scattering of gamma rays
slope factor	estimate of the excess probability of developing cancer per unit exposure to a carcinogen over a lifetime, estimated from 95 percent confidence level of available data
source	medium from which contaminants migrate into the surrounding environment (for example, seeps and springs in the riparian area of the Columbia River)
source term	amount of radioactivity (curies) of a radionuclide or amount of a chemical contained within a facility or released to the environment at a given time
SP	seep water
spent fuel	irradiated fuel discharged from a reactor
springs	discharge zone located above river water level
SST	single-shell tank
stack	tall chimney that was the primary release point of exhaust air from a reactor or separations plant building
stochastic analysis	set of calculations performed using randomly selected parameter values from probability distributions for each parameter; in contrast, see deterministic analysis
stochastic variability	natural random variation of a measured quantity around a central value; for example, in a room full of people, there is an average height with some being taller and some shorter; the stochastic variability of that group is described by the differences between the individuals' heights and the average; see deterministic value



Supply System	Washington Public Power Supply System
surrogate (measurement)	substituted value used when actual measurement is unavailable
surrogation	method used to fill data gaps with substitute data from the same location but from a different medium
SW	surface water
taxonomic group	an established category of organisms
Thiessen polygon	subdivision of space around points of measurement; the polygon defines all points that lie nearer the contained measurement point than measurement points outside the polygon; in the screening assessment the Thiessen polygon was used to define the area represented by the data from a groundwater well and, thereby, refine the segmentation of the river
threatened species	species which is likely to become endangered in the foreseeable future
TLD	thermoluminescent dosimeter; identified as “external radiation” in the text of this report
TLM	threshold limit for fresh water
TLV	Threshold Limit Value used to estimate an effective reference dose for inhalation
toxicological benchmark	reference value from toxicity tests that is used as a basis of comparison for estimated exposures
TPA	Tri-Party Agreement; officially, <i>Hanford Federal Facility Agreement and Consent Order</i> (Ecology et al. 1994)
transfer factors	the ratio of the reported body burden to that of the organism’s food, or to the water concentration in the case of fish (also termed “concentration factors”)
Tri-Party agencies	three government agencies (U.S. Department of Energy, U.S. Environmental Protection Agency, and the Washington State Department of Ecology) that are signatories to the Tri-Party Agreement
TSD	treatment, storage, and disposal facilities or units at the Hanford Site



TWRS	tank waste remediation system
uncertainty	measure of the likelihood of a certain amount of variability in model parameters or dose estimates
USACE	U.S. Army Corps of Engineers
USGS	United States Geological Survey
UST	underground storage tank
verify	demonstrate that software correctly solves mathematical equations and performs data processing it was designed to perform; ensure that a computer code correctly performs operations specified in a numerical model
VOC	volatile organic compounds
WADOH	Washington State Department of Health
waste management unit	various waste sites, including past practice sites; surplus facilities; and treatment, storage, and disposal facilities
WHC	Westinghouse Hanford Company

References

42 USC 4321 et seq. (as amended). January 1, 1970. "National Environmental Policy Act of 1969." Public Law 91-190.

42 USC 6901 et seq. (as amended). October 21, 1976. "Resource Conservation and Recovery Act of 1976." Public Law 94-580.

42 USC 9601 et seq. (as amended). December 11, 1980. "Comprehensive Environmental Response, Compensation, and Liability Act of 1980." Public Law 96-510.

DOE - U.S. Department of Energy. 1995. *Hanford Site Risk Assessment Methodology*. DOE/RL-91-45, Rev. 3, Richland, Washington.

Ecology - Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy. 1994. *Hanford Federal Facility Agreement and Consent Order*. Document No. 89-10, Rev. 3 (The Tri-Party Agreement), Olympia, Washington.



EPA - U.S. Environmental Protection Agency. 1996. *Proposed Guidelines for Ecological Risk Assessment*. EPA/630/R-95/002B, Washington, D.C.